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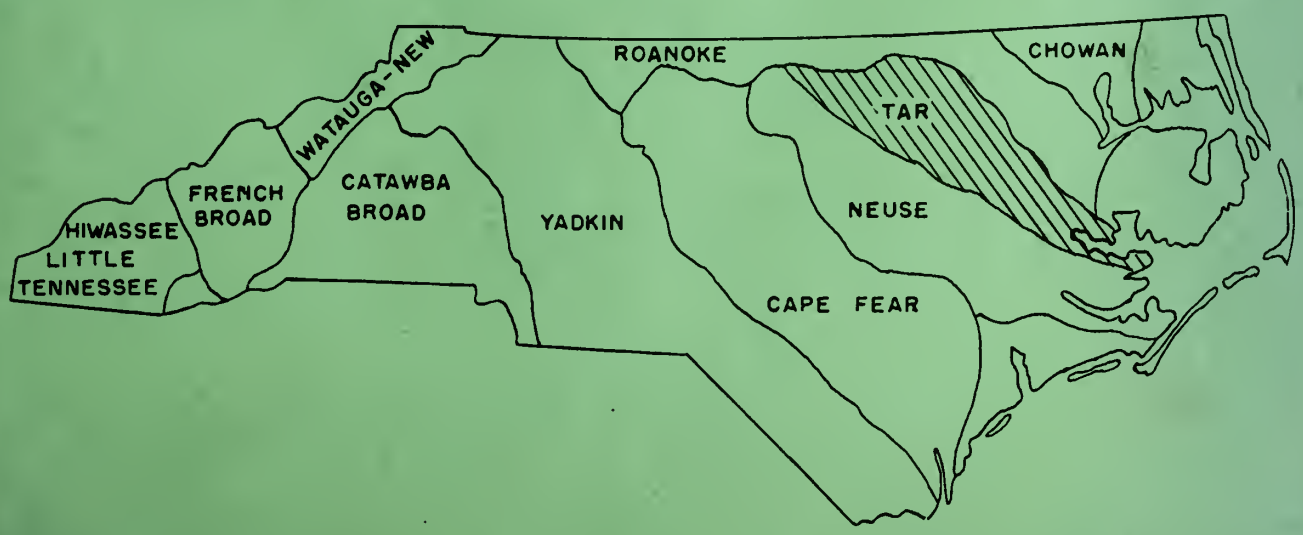
WATER RESOURCES OF NORTH CAROLINA
TAR PAMLICO RIVER BASIN



RALEIGH

1958

FOREWORD

This publication comprises Volume IX of a series of twelve volumes containing information regarding water resources of North Carolina. Volumes I to VIII, inclusive, were published as follows:

I State as a whole, January 1955
II Neuse River Basin, May 1955
III Yadkin-Pee Dee River Basin, August 1955
IV Chowan River Basin, December 1955
V Roanoke River Basin, February 1957
VI French Broad River Basin, November 1957
VII Cape Fear River Basin, September 1958
VIII Broad and Catawba River Basins, October 1958.

Volumes X, XI, and XII will provide inventories of the Hiwassee and Little Tennessee, Kanawha and Watauga, and Coastal Plain River Basin, respectively, and will be published during the next six months. Information pertaining to the entire State will then be available to assist in the orderly planning and development of the water facilities required for municipal and industrial expansion and for the expansion of the uses of water for agriculture, and to guide watershed authorities, basin associations, soil conservation districts and other agencies concerned with water uses in accomplishing their purposes.

It is hoped that this publication will assist in the location, development, and expansion of municipal, industrial, agricultural, and other water supplies, and serve as a guide to the future study of the water resources of the Tar-Pamlico River Basin.

Grateful appreciation is hereby extended to persons who provided material for this volume as follows:

Chapter I - Corps of Engineers, U. S. Army, and Almanac Publishing Company, Raleigh, North Carolina.

Chapter II - Geological Survey, U. S. Department of the Interior.

Chapter III - Almanac Publishing Company.

Chapter IV - Geological Survey, U. S. Department of the Interior.

Chapter V - Almanac Publishing Company and Corps of Engineers, U. S. Army.

Chapters VI, VII, and VII - Geological Survey, U. S. Department of the Interior.

Chapter IX - North Carolina State Stream Sanitation Committee.

Chapter X - Soil Conservation Service, U. S. Department of Agriculture.

Chapter XI - Corps of Engineers, U. S. Army.

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CHAPTER I - DESCRIPTION OF WATERSHED

Main Stream - The Tar River rises in the west-central part of Person County about seven miles west of Roxboro. It flows in a generally southeasterly direction through Granville, Franklin, Nash, Edgecombe, and Pitt Counties to Washington, county seat of Beaufort County, where it empties into the Pamlico River at sea level. The total length of the Tar River is 179 miles. The area of its basin is approximately 3,100 square miles. The elevation of the source of the stream is approximately 550 feet above mean sea level.

From its source to the City of Rocky Mount, it flows throughout the Piedmont Plateau and drops 465 feet in a distance of 99 miles. In the vicinity of Rocky Mount, there is a vertical drop of 27 feet where it crosses the Fall Zone and enters the Coastal Plain. It flows 80 miles through the Coastal Plain to its mouth in Pamlico River, with a drop of 58 feet. Throughout its reaches, except in the vicinity of Rocky Mount, the gradient of the stream is comparatively uniform. It has no tidal reach.

The Pamlico River flows in a southeasterly direction about 33 miles and empties into Pamlico Sound about 32 miles northwest of Ocracoke Inlet, an opening through the Outer Banks between Pamlico Sound and Raleigh Bay.

Principal Tributaries - The principal tributaries of the Tar River, as it is ascended, are as follows: Tranters Creek, which joins it from the left bank near its mouth; Town Creek, which joins it from the right bank at Old Sparta about eight miles south of Tarboro; Fishing Creek, its largest tributary, which joins it from the left bank about three miles northwest of Tarboro; and Swift Creek which has its confluence with the main stream about seven miles above the mouth of Fishing Creek and which drains an area northwest of the main stream.

Tranters Creek rises in the southwestern corner of Martin County and forms the Martin-Pitt County line during most of its flow.

Town Creek rises in Wilson County about 2.5 miles north of Elm City and flows in a generally easterly direction through Wilson and Edgecombe Counties to its confluence with Tar River indicated above.

Fishing Creek rises in Vance County about five miles northeast of Henderson and flows northeasterly in Vance and Warren Counties, and southeasterly and southerly in Warren County, to the Warren-Franklin County line. It forms successively the Warren-Franklin, Halifax-Nash, and Halifax-Edgecombe County lines to a point about seven miles north of Tarboro, whence it flows southerly to the confluence with Tar River indicated above. Fishing Creek has a drainage area of approximately 760 square miles and crosses the Fall Zone upstream from the Town of Enfield.

Sandy Creek, the longest tributary of Swift Creek, rises in Vance County about three miles northeast of Henderson and flows in a generally southeasterly direction through Vance, Warren, Franklin, and Nash Counties to its confluence with Swift Creek about nine miles north of Nashville. Swift Creek thence flows easterly in Nash County and southeasterly in Edgecombe County to the confluence with Tar River indicated above. Swift Creek and its tributary, Sandy Creek, have a straight-line length of about 50 miles and a drainage area of approximately 350 square miles.

Tributaries of the Pamlico River, in addition to Tar River, include Pungo River; Rose, Swanquarter, Juniper, West Bluff, and Chocowinity Bays; and Broad, Bath, Blount, Bond, Durham, East, Goose, James, South, and Upper Goose Creeks.

Relation to other streams - The Tar River has a course practically parallel to those of the lower Roanoke River to the north and the Neuse River to the south. It is nearer to the former stream which is only 14 miles distant at Tarboro. All three of these rivers have navigable reaches and are connected by the Atlantic Intracoastal Waterway.

Characteristics of the basin - The drainage basin of the Tar River is oblong in shape, its greatest width being about 45 miles. The length of the area is approximately 120 miles. The main stream flows near the southern boundary of the area, most of its drainage being to the north. The divide on the south is seldom more than 5 to 10 miles distant from the stream. The basin, with a drainage of approximately 3,100 square miles, is the third largest intrastate basin in North Carolina, the other two being the Neuse River Basin (approximately 5,490 square miles) and the Cape Fear River Basin (approximately 8,570 square miles). The basin includes large parts of Beaufort, Edgecombe, Franklin, Granville, Halifax, Nash, Pitt, Vance, and Warren Counties, and small parts of Martin, Person, and Wilson Counties.

Agricultural development - This basin is probably in the highest state of any area along the seaboard streams of North Carolina. The principal agricultural products, in order of importance, are tobacco, cotton, corn, peanuts, and truck produce. The livestock industry is of lesser importance.

Industries - The principal industries are the manufacture of textile goods and tobacco products. Lumbering is carried on extensively in the coastal region of this area, the principal merchantable timbers being long and short leaf pine and gum. The latter is used in the manufacture of boxes, crates, and furniture. The area is given over primarily to agriculture, and the industrial development has not acquired the importance that it has in other parts of the State.

Principal cities and towns - The principal cities and town in the Tar River Basin, with their populations, are as follows:

Municipality	1920	1930	1940	1950
Rocky Mount	14,000	21,412	25,568	27,697
Greenville	3,772	9,194	12,674	16,724
Henderson	5,222	6,345	7,647	10,996
Washington	6,314	7,035	8,569	9,698
Tarboro	4,568	6,379	7,148	8,120
Oxford	3,606	- -	3,991	6,685
Louisburg	1,954	- -	2,309	2,545
Enfield	1,648	- -	2,208	2,361
Nashville	- -	- -	1,171	1,302
Spring Hope	1,221	- -	1,222	1,275

Transportation - The main lines of the Atlantic Coast Line Railroad between Halifax and Wilson and the Seaboard Air Line Railroad between Norlina and Franklinton, and branches of the Southern Railway and the Atlantic Coast Line Railroad, pass through the Tar River Basin.

Topography - The upper one-fourth of the basin lies in the Piedmont Plateau, a region characterized by low, rounded hills and wide stream-valleys. Elevations in this section of the basin range up to 550 feet above sea level. The remaining area lies in the Sand Hills and Coastal Plain region, with elevations ranging from 200 feet, near the eastern edge of the Piedmont Plateau, to sea level on the coast. In the lower region of the basin, the hills give way to broad swells and level lands sloping toward the coast. Stream valleys are very wide,

and the banks are shallow, which subjects much of the land to overflow during freshet stages of the rivers.

Geology - In the Piedmont region, the soils are usually shallow and are made up of sand and clay, derived principally from granite or slate origin. The underlying rocks are, for the most part, granite and other igneous types, metamorphosed slates, and schists. The slopes are fairly steep, producing high rates of runoff, little storage, and consequent high floods with subsequent periods of extreme low-water.

The Coastal Plain soils consist mostly of sand and marine deposits. This region is characterized by extensive marshes, in which are found a fine, black soil especially suitable for agricultural purposes if properly drained.

The entire basin is underlain by the basement or crystalline rocks which vary in depth from 50 to 150 feet in the Piedmont and Sand Hill regions. These rocks begin to slope downward under the coastal plain and continue to increase in depth toward the lower end of the basin, lying from 2,000 to 2,500 feet underground near the coast line.

Cover and Climate - Approximately 65 percent of the area in this basin consists of forest lands, of which 40 percent is farm woodland and 6 percent is woodland pasture. Most of the remaining area of the basin is devoted to agricultural purposes.

The temperature of the Tar-Pamlico River Basin may be described as moderate, due to the location of the area in the warm-temperature zone and the relatively small variations in elevation above sea level. The mean annual temperature ranges from 62.5 degrees, on the coast, to 58.5 degrees in the extreme upper part of the basin. The mean annual temperature of the entire basin is 60.5 degrees, as determined from the records of the U. S. Weather Bureau stations in the basin. Temperatures of over 100 degrees are occasionally recorded in summer, and freezing weather occurs with moderate frequency during the winter. However, freezing temperatures are seldom of more than one day's duration.

Most of the precipitation in this basin occurs as rainfall. The small amounts of snow which fall are unimportant, since they are not sufficient to remain and cause damaging spring-freshets. The mean annual rainfall for the entire basin is 45.92 inches, as determined from the records of nine U. S. Weather Bureau stations located within the area. The minimum annual-rainfall occurred at Henderson in 1921, and was 28.79 inches; the maximum annual-rainfall occurred at Tarboro in 1887, and was 70.88 inches.

The annual rainfall is fairly evenly-distributed throughout the year. The maximum and minimum monthly-rainfalls usually occur in July and November, respectively.

Mapping - Complete plan and profile maps of the Tar River and Fishing Creek have been prepared from surveys by the Corps of Engineers, U. S. Army. Topographic maps, prepared by the U. S. Geological Survey, have been completed for a considerable area of the basin.

Mineral Resources - There are no important mineral resources in the area. A fair quality of granite is found at numerous points. There are also deposits of clay suitable for the manufacture of bricks. Sand for use in concrete is found in abundance. These resources are developed only as they are needed locally. Marl for use in the manufacture of fertilizer is mined to a limited extent.

Lumbering - Although considerable lumbering is still carried on in the basin and there are a large number of sawmills in operation, this industry has declined, since most of the original growth of pines and hardwoods has been cut. Principal types of merchantable timber in the basin are loblolly or short-leaf pine, gum, ash, oak, poplar, and hickory.

Forest cover - The basin of the Tar River, at one time, was heavily forested. Much of the timber, however, has been removed. This is particularly true in the Piedmont Plateau region. In that section, the only timber remaining in large tracts is found in the stream bottoms. In the Coastal region, the forest cover is still heavy but is being depleted by lumbering operations. Where the land cleared has not been put into cultivation, second-growth timber has prospered, and a fair stand of trees will again cover these areas in a few years. It is estimated that not more than 25 percent of the entire area is forest covered at present, the principal species being long and short leaf pine, gum, hickory, and oak.

Rainfall - Rainfall stations, maintained in the Tar River Basin by the United States Weather Bureau, are well distributed over the entire watershed. Their records show that the mean annual rainfall of the area is 46.59 inches. The annual precipitation decreases as the distance from the coast increases. The altitude of the different portions of the basin apparently has no effect on the intensity of the rainfall. The annual rainfall at Henderson in 1921 was 28.79 inches, and the annual rainfall at Tarboro in 1887 was 70.88 inches. The monthly precipitation is quite evenly distributed.

Unusual storms - During the month of July 1919, numerous thundershowers kept the soil well saturated during the first week of the month. On the 7th and 8th, heavy rains fell, causing bank-full stages on all of the streams. This precipitation measured from 1.5 to 5 inches over the entire area. The high stages on the streams were maintained by heavy showers on the 12th, 13th, and 14th. On the 16th, there was additional heavy rainfall on the upper basin, 4.10 inches being recorded at Henderson. Precipitation began over the entire watershed again on the 17th, rains of from 0.5 to 5 inches being recorded daily at practically all points. These rains reached their maximum intensity on the 23d when from 2 to 5 inches of precipitation was recorded over the entire basin, except on the extreme upper part of the area. Owing to the saturated condition of the soil, a high rate of runoff occurred, and the already-swollen streams in many instances attained the highest stages on record.

During September 1924, two tropical disturbances passed up the Atlantic coast. The first of these hurricanes, which formed in the Gulf of Mexico on the 12th of September, passed off Cape Hatteras on the 15th and was accompanied by high winds and heavy rains. These rains caused bank-full stages on the streams in the Tar River Basin and saturated the soil. Thundershowers followed this storm, maintaining the high stages and keeping the ground wet. On the 28th, the second hurricane was observed off the coast of Cuba. This storm crossed the Florida peninsula and followed a path along the Atlantic coast. It passed over the Tar River Basin on the 30th of September, causing heavy precipitation over this area. A rainfall of 6 inches was recorded at Nashville on that date. As the ground was already saturated, a high rate of runoff resulted, causing the second highest stage on record on the Tar River.

Heavy rains fell over the drainage basin of the Tar River, beginning on September 1, 1928 and continuing through September 6. This precipitation caused high stages on all of the streams and thoroughly saturated the soil. Almost daily showers of heavy intensity occurred until the 17th when the West Indian Hurricane,

which caused much damage in Porto Rico and Florida, passed over the Tar River Basin, causing high winds and heavy precipitation. Since the ground was saturated, heavy runoff resulted and caused the streams, which were already full in their lower reaches,to rise to unusually high stages. This storm caused the third highest flood on record on the Tar River.

Periods of drought - Annual rainfall records at Tarboro, 1890-1927, inclusive, show that years, in which the mean annual precipitation fell below 40 inches, was rare, only 1900 (39 inches) and 1921 (34 inches) being below this figure. In almost every instance, a dry year was followed by a wet one. It appears that prolonged droughts in this area are of rare occurrence. The average minimum-rainfall for the area was 35.64 inches. In general, November is the driest month. Heavy rains are common in September.

Runoff - It appears that about 33 percent of the rain, falling on the Tar River area, passes down the streams as runoff during normal years. This ratio increases to 60 percent during unusual storms.

The soils of the Piedmont region are mostly of clay and slate origin, the top soil being usually shallow and underlain by slate, quartz, and granite. The slopes are fairly steep and there is, consequently, a high rate of runoff during times of heavy precipitation. Due to this fact, little moisture is stored to maintain a constant flow, and streams in this section are subject to violent floods and periods of extreme low water.

The belt of sand hills, which divides the Piedmont section from the Coastal plain, is known as the Sand Hills region or the Fall Zone. The soil in this section is composed largely of sand, with some gravel which becomes thicker as the Coastal region is approached. The sand and gravel are underlain by the basement rocks and, as the water percolates through the sand, it finally encounters this impervious formation and is then returned to the streams. For this reason, the tributaries draining this belt have a very constant flow. Town Creek in Wilson and Edgecombe Counties, which has an airline length of about 19 miles, is a stream of this character.

The Coastal Plain is composed largely of sand and marine deposits and, being flat, has a low rate of runoff. Consequently, much of the rain falling in this locality is lost from the streams and is either evaporated or percolates down to some coarse water-sand and thence flows to the sea. However, if the sand is saturated prior to a heavy rainfall, large areas are inundated because of the flat slopes, and the very fact that this region has a low flood-flow rate causes the water to be present when the floods from the Piedmont section arrive. Such conditions cause high stages and consequent damage to crops.

Forest cover exerts little influence on the runoff of the area. Runoff during June, July, and August is materially affected by the very high rate of evaporation during this period of the year. However, these are also wet months, and this high rate of evaporation does not materially interfere with the operation of water-power plants. The winters in this locality are mild, and ice seldom forms to interfere with the runoff.

Silt deposits - No data is available as to the amount of silt carried by the Tar River or its tributaries. The U. S. Geological Survey has determined that the Ocmulgee River at Macon, Georgia, carries an average of 174 parts per million in suspension for each million parts of water which pass down the stream. A similar study of the Savannah River at Augusta, Georgia, disclosed that this stream carries 142 parts per million. As these streams drain a region of the same general type as that drained by the Tar River, it is believed safe to assume

that the silt carried by this stream does not exceed 200 parts per million.

General Information Regarding Counties Within or Partially Within the Tar River Basin

The counties within or partially within the Tar River Basin include Beaufort, Edgecombe, Franklin, Granville, Halifax, Martin, Nash, Person, Pitt, Vance, Warren and Wilson. The areas of Martin, Person, and Wilson Counties, lying within the Tar River Basin, are small. Information regarding Martin and Person Counties may be found in "Water Resources of North Carolina-Roanoke River Basin". Information regarding the other counties indicated above is set forth below.

Beaufort County - This county was created out of Bath County in 1705 and named in honor of the Duke of Beaufort, a Lord Proprietor. It is one of the oldest counties in the State and was first settled in 1690 by French Protestants. By 1700, a number of Quakers had settled in the county. The Tuscaroran Massacre of September 22, 1711 almost wiped out the settlements. Blackbeard (Edward Teach), the pirate, headquartered near Bath, the oldest unincorporated town in the State.

In the central Coastal section, Beaufort is flat, low, and generally fertile, with considerable swampland. The forests contain pond-pine, gum, cypress, and hardwoods. The waters are the Pamlico River (upstream called the Tar River), Pungo River, and numerous creeks and bays. The Pamlico River has a 12-foot channel from Washington to Pamlico Sound.

Mainly agricultural, it also is a maritime and lumbering county. Tobacco is the chief crop, followed by corn, soybeans, and Irish and sweet potatoes. The handling, packing, and distribution of seafood is an important industry. The largest crab-meat packing-plant in the south is at Belhaven. Washington is a wholesale and retail center and tobacco-warehouse town. Tulip-growing by Hollanders at Terra Ceia is successful. The mish grape was developed here by, and named for, a pioneer family.

There is an Episcopal Assembly Ground on the river 10 miles below Washington. Bath has the oldest church in the State and many other interesting buildings. Washington is the birthplace of movie producer William deMille; Dr. Susan Dimock, first North Carolina woman to be licensed as a physician; and Josephus Daniels, Editor of "The News and Observer", Secretary of the Navy, and Ambassador to Mexico. The Courthouse was erected in 1800.

Communities include Washington (county seat), Belhaven, Aurora, Bath, Pantego, and Bayview.

Rainfall (inches)	50.63
Snowfall (inches)	4.3
Mean annual temperature (degrees)	61.9
Growing season (days)	223
Tobacco (1951 Val.)	$10,297,950
Corn (1951 Val.)	$2,371,630
Soybeans (1951 Val.)	$1,435,350
Total Land Area (acres)	531,840
Forest Area (acres)	370,300
Population (1940)	36,431
Population (1950)	37,134
Total Tax Value	$37,978,237
Tax rate	$1.40

Edgecombe County - This county was formed in 1735 from Bertie County and named in honor of the Earl of Edgecombe, British Trade Commissioner. Tarboro, which was laid out in 1769 near the site of an earlier community established by English settlers, played host to the State Legislature in the early days.

In the northern coastal section, Edgecombe is level with both uplands and swamps. Chief merchantable timbers are loblolly pine, gum, and oak. Waters include the Tar River, Cokey and Whiteoak Swamps, and Bynum Mill, Deep, Harts Mill, Otter, Swift, Town and other creeks.

A rich agricultural county, tobacco and peanuts are chief cash crops, followed by cotton. Other crops include hay, corn, soybeans, and truck crops. Livestock, principally hogs and beef cattle, are important. Rocky Mount and Tarboro are the chief industrial centers. Tarboro has several cotton textile and knitting mills, as well as cornmeal, feed, veneer, and cottonseed manufactures. Rocky Mount is a large textile and tobacco-processing center, with tobacco-drying plants and 14 tobacco-auction warehouses, and also contains shops of the Atlantic Coast Line Railroad.

Tarboro Common contains monuments to Colonel Louis D. Wilson, who represented the County in the General Assembly, and Henry L. Wyatt, a Confederate soldier. Calvary Episcopal Church, in Tarboro, was organized in 1741. Near Tarboro is Bracebridge Hall (private), the birthplace of Governor Ellias Carr (1893-97).

Communities include Tarboro (county seat), Rocky Mount, Whitakers, Princeville (one of the few unincorporated villages in the Nation operated by Negroes), Pinetops, Conetoe, and Speed.

Rainfall (inches)	47.21
Snowfall (inches)	6.4
Mean annual temperature (degrees)	61.3
Growing season (days)	208
Tobacco (1951 Val.)	$14,361,690
Peanuts (1951 Val.)	$3,057,020
Cotton (1951 Val.)	$2,782,260
Total Land Area (acres)	309,056
Forest Area (acres)	145,261
Population (1940)	49,162
Population (1950)	51,634
Total Tax Val.	$53,900,000
Tax Rate	$1.15

Franklin County - In the northwest Coastal Plain, Franklin is gently rolling. Chief merchantable species of trees are second-growth loblolly and shortleaf pine. Waters are the Tar River and Buffalo, Cedar, Crooked, Cypress, Lynch, Norris, Sandy, and other creeks.

Mainly agricultural, the leading crop is tobacco, followed by cotton and corn. Poultry is important. There is little industry in the county, the largest being textile mills at Franklinton. There is a garment plant at Youngsville. Several lumber mills are operated. Louisburg has a tobacco-auction market and lumber mills. Louisburg College, one of the oldest junior colleges in the United States (1779), is at Louisburg.

Points of interest at Louisburg are the drinking fountain and marker on Courthouse Square, commemorating the first of the Confederacy's four flags,

displayed first in North Carolina at Louisburg in 1861; the John Allen Place (private); the Old Collins Place (private); and the Home of Green Hill (private) where the first North Carolina Methodist Conference was held in 1785.

Communities include Louisburg (county seat), Franklinton, Youngsville, Alert, Bunn, Wood, Gupton, Justice, Stallings, Mapleville, Wilder, New Hope, and Katesville.

Rainfall (inches)	45.30
Snowfall (inches)	9.9
Mean annual temperature (degrees)	61.2
Growing season (days)	198
Tobacco (1951 Val.)	$13,211,780
Corn (1951 Val.)	$1,281,240
Cotton (1951 Val.)	$1,928,380
Total Land Area (acres)	316,160
Forest Area (acres)	140,000
Population (1940)	30,382
Population (1950)	31,341
Total Tax Val.	$21,689,044
Tax Rate	$1,08

Granville County - This county was formed in 1746 from Edgecombe County and named in honor of John Carteret, Earl of Granville, one of the Lord Proprietors who refused to sell his share of the Province of Carolina to the King of England. In the 17th and early 18th centuries, the region was the home of 17 Indian tribes, including the Tuscaroras. Oxford was incorporated as county seat in 1811 and named for the plantation of Samuel Benton, on which the town was built.

In the upper Piedmont, Granville is bordered on the north by Virginia. Its land is rolling. The chief merchantable species of timber are pine and oak. Waters in the Tar River Basin include Tar River and Ford, Gibbs, Fishing, Aycock, Johnson, Jackson, Owen, Shelton, and other creeks.

Tobacco, corn, hay, and vegetables are the chief cash crops. Other crops include Irish and sweet potatoes, cotton, and small grains. Dairy products are important. The leading industries are textiles, lumbering, and tobacco manufactures. The largest single employers are a cotton-textile mill and a wooden-container plant, both at Oxford. There are also planing and plywood mills, four tobacco stemming and redrying plants, two grain mills, and a hosiery plant. There are planing and plywood mills at Creedmoor. Oxford is the tobacco market and manufacturing center. The business of a milk plant in Osford amounts to approximately $500,000 annually.

Points of interest include Camp Butner, a military reservation during World War II and now a State Mental Hospital; Oxford Orphanage, opened in 1873 by North Carolina Masons; the Oxford Colored Orphanage which was founded by Negro Baptists and is a State institution; the site near Stovall of the home of John Penn, a signer of the Declaration of Independence; the State's tobacco test-farm; and the County Courthouse which has records dating back to 1786.

Communities include Oxford (county seat), Creedmoore, Stem, Dickerson, Providence, Clay, Wilton, Northside, Wilkin, Cozart, Berea, Lewis, Gela, Satterwhite, and Bullock.

Rainfall (inches)	44.55
Snowfall (inches)	12.2
Mean annual temperature (degrees)	58.8

Growing season (days)	202
Tobacco (1951 Val.)	$12,457,880
Corn (1951 Val.)	$1,061,220
Hay (1951 Val.)	$681,360
Total Land Area (acres)	347,520
Forest Area (acres)	187,400
Population (1940)	29,344
Population (1950)	31,793
Total Tax Val.	$36,151,635
Tax Rate	$.90

Halifax County - This county was formed in 1758 from Edgecombe County and named in honor of the Earl of Halifax, President of the British Board of Trade, which had the control of the Colonies before the Revolution. This area was settled as early as 1722 by a colony of Scotch Highlanders from Virginia. Halifax (county seat) was the scene of North Carolina's first constitutional convention, and has been the home of many leading statesmen, including Willie Jones, General William R. Davie, and William Hooper. "The Halifax Resolution" was the first State sanction of independence, adopted at Halifax on April 12, 1776.

In the northeast Piedmont and northwest Coastal regions and adjoining the Virginia State Line, Halifax is low and rolling. The northern "fall zone" passes through the county. Brick clays occur in several places. The chief merchantable species of timber are loblolly pine, gum, oak, and ash. Waters in the Tar River Basin include Beaverdam, Beech, Burnt Coat, Jacket, Marsh, and Rocky Swamps and Butterwood, Fishing, Little Fishing, and other creeks.

The chief cash crops are tobacco, peanuts, and corn. Hogs and beef cattle are important. The county ranks third among counties of the United States in value of peanuts produced. Other crops include corn, wheat, and oats. The leading industry is textiles, and the damask mill at Roanoke Rapids is the largest of its kind in the world. Other textile mills include cotton-textile mills, a drying and finishing plant, and a hosiery mill. Peanut-processing plants are located at Weldon and Enfield, and Roanoke Rapids has pulp mills. Lumber operations are important. Pine pulpwood, veneers, ties, and pilings are produced. The East Carolina Industrial Training School, a college for Negroes, is located near Enfield.

The Old Ordinary Tavery ("Old Ornery"), 1774, at Littleton, now houses a grade school. The old jail (1759), where Flora MacDonald, the Scottish heroine, visited, is located in Halifax. The Grove Colonial Mansion, which housed John Paul Jones ("the father of the American Navy") and was owned by Willie Jones ("the Jefferson of North Carolina"), still stands in part at Halifax. Mosby Hall (1774) is at Littleton. Bones of an icthyosaurus were excavated at Fishing Creek near Enfield some years ago. There is, on the bank of the creek, a large, flat stone which is impressed with human and animal footprints and indicates designs. Eagle Hotel at Halifax served as headquarters for members of the Provincial Congress and assemblies that met there. Constitution House, in which the first Constitution of North Carolina was drawn, has been restored. Near Enfield is Branch Plantation, home of Governor John Branch (1817-20). The State operates a prison farm at Caledonia.

Communities include Halifax (county seat), Roanoke Rapids, Weldon, Enfield, Scotland Neck, Littleton, Hobgood, and Palmyra.

Rainfall (inches)	44.86
Snowfall (inches)	8.2
Mean annual temperature (degrees)	61.7

Growing season (days)	199/207
Tobacco (1951 Val.)	$6,939,890
Peanuts (1951 Val.)	$5,980,400
Cotton (1951 Val.)	$4,660,980
Total Land Area (acres)	462,080
Forest Area (acres)	197,900
Population (1940)	56,512
Population (1950)	58,377
Total Tax Value (est.)	$62,000,000
Tax Rate	$1.00

Nash County - This county was formed in 1777 from Edgecombe County and was named for General Francis Nash, a soldier of the Revolution, who was mortally wounded while fighting under Washington at Germantown. Nashville, county seat, was settled in 1780 and incorporated in 1823.

In the northern Coastal region, Nash has a rolling topography with sandy soil well suited for farming. Brick and tile clays are found along the Tar River near Rocky Mount which lies partly in Nash County and partly in Edgecombe County, the main line of the Atlantic Coast Line Railroad being the boundary between the two counties at Rocky Mount. A granite belt extends westward from the city for about 20 miles. There is some brick production at Rocky Mount. Chief merchantable species of trees are short-leaf and loblolly pine, oak, and gum. Waters in the Tar River Basin include Tar River and Sapony, Little Sapony, Stony, Swift, Sandy, Fishing, and other creeks.

Lying in the bright-leaf belt, Nash is one of the leading tobacco-growing counties in the State. Other crops grown are corn, Irish and sweet potatoes, oats, hay, peanuts, and truck crops. Textile manufacturing is the county's leading industry, with cotton, rayon, and silk mills at Rocky Mount. Tobacco manufactures, lumbering, and producers of cotton oil are located at Rocky Mount and other communities to the north. Other manufactures include food, brick, and furniture. Rocky Mount is the fourth largest tobacco-market in the world. It is also a rail-road center.

The Battle Homestead near Battleboro has been the property of the Battle family since 1742 when Elisha Battle, member of the Halifax Convention in 1776, purchased the Tar River bottomland from the Earl of Granville. At Rocky Mount, one of the fourteen warehouses, covering a city block, is crowded with thousands of guests at the annual June German given by the Carolina Cotillion Club, an important social event since 1880. The Thomas Hackney Braswell Library contains a collection of artifacts, paper money, old records, and curios. Near Rocky Mount, the Lewis Home (1783) is said to have been built from bricks brought from England, each wrapped in paper. The Dortch House was built in 1789.

Communities include Nashville(county seat), Rocky Mount, Spring Hope, Bailey, Middlesex, Sharpsburg, Castalia, Battleboro, Red Oak, and Dortches.

Rainfall (inches)	46.21
Snowfall (inches)	8.5
Mean annual temperature (degrees)	60.5
Growing season (days)	205
Tobacco (1952 Val.)	$17,000,000
Corn (1952 Val.)	$3,000,910
Cotton (1952 Val.)	$3,500,400
Total land area (acres)	353,280
Forest area (acres)	157,200
Population (1940)	55,608

Population (1950)	59,919
Total Tax Val. (1952)	$69,341,488
Tax Rate (1952)	$1.15

Pitt County - This county was formed in 1760 from Beaufort County. It was named for William Pitt, Earl of Chatham. The county seat was established at Martinborough in 1774. It was later moved and named Greenville in honor of General Nathaniel Greene.

Lying in the central Coastal region, Pitt County has a low, fertile land which in intensively cultivated. Clays suitable for brick-making are found near Greenville, and marls are distributed throughout the county. Chief merchantable species of trees are loblolly pine, gum, cypress, and oak. Waters in the Tar River Basin include Tar River, Cannon Swamp, and Chicod, Conetoe, Grindle, Hardee, Harris, Kitten, Otter, Tranters, Tyson, and other creeks. Tar River is navigable to Greenville which is the farthest inland port in North Carolina having a 12-foot channel.

Pitt County is the largest tobacco-growing county in the State. Greenville, a tobacco center, has fifteen tobacco-warehouses, while Farmville also ranks high in the sale of tobacco. Corn and peanuts are major cash-crops. Other crops include cotton, Irish and sweet potatoes, poultry, and eggs. Livestock, particularly hogs, is an important farm-resource, and one of Eastern North Carolina's largest livestock-buying firms is located in Greenville. Industries, concentrated in Greenville and Farmville, are fairly diversified. There are tobacco stemming and redrying plants in both communities. Other industries include textile mills, sawmills, planing and plywood mills, fertilizer plants, furniture, lumber, drug, machine, and food manufactures, and a plastic-products plant. East Carolina College, a State institution, is located in Greenville. The college is coeducational and offers courses in teacher training and liberal arts.

Logtown, known as Martinborough before 1788, was the first county seat. A tablet marks the site of the courthouse. Part of the first brick road in Eastern Carolina, built by the King's representative, Parson Blount, for rolling brandy barrels up the hill, is located near Logtown. The Grimes House (private), near Grimesland, was erected in 1793 by Dempsie Grimes I, and since then has been occupied by his descendants. Confederate General Bryan Grimes and J. Bryan Grimes, who served as North Carolina Secretary of State, were born here. Near Farmville, on U. S. Highway 264, is a tablet marking the course of the Old Hull Road, cut during the Revolution by British troops.

Communities include Greenville (county seat), Ayden, Bethel, Falkland, Farmville, Fountain, Grifton, Grimesland, Pactolus, Simpson, Stokes, and Winterville.

Rainfall (inches)	49.73
Snowfall (inches)	6.9
Mean annual temperature (degrees)	61.4
Growing season (days)	215
Tobacco (1952 Val.)	$23,813,011
Corn (1952 Val.)	$3,382,150
Livestock Sold (1952 Val.)	$1,088,404
Total Land Area (acres)	419,840
Forest Area (acres)	185,600
Population (1940)	61,244
Population (1950)	63,789
Total Tax Val.	$63,500,000
Tax Rate	$.90

Vance County - This county was formed in 1881 from Granville, Warren, and Franklin Counties. It was named in honor of Zebulon B. Vance, "the Great War Governor", a member of Congress, Governor of North Carolina, and United States Senator.

Vance, in the northeast Piedmont bordering Virginia, has the characteristic rolling-terrain of this section, with an altitude of about 500 feet. Largely agricultural, it is more akin to the Coastal Plain than it is to its Piedmont neighbors to the southeast. The county has large reserves of granite, which have been quarried for many years, being used for paving blocks, copings, and, to some extent, for building. In recent years, a sensational field of tungsten, embedded in granite and located near Townsville in the Roanoke River Basin, has been discovered, and substantial operations have resulted therefrom. Some 300 tons of ore are produced daily, with an annual output valued at $1,000,000. It is the largest tungsten-producing field in North America. The forests have been well cut over, and most of those remaining are farm woodlands. Waters in the Tar River Basin include Tar River and Buffalo, Fishing, Long, Lynch, Red Bud, Ruin, Sandy, Tabbs, Weaver, and other creeks.

About 70 percent of the farm income is derived from field crops, with the principal crop in tobacco. Industry is almost entirely concentrated in Henderson (county seat), with most of the industry engaged in textile work. There are also tobacco-redrying plants, sawmills, and heavy-duty truck manufactory. Henderson is a bustling tobacco-auction market.

Communities include Henderson, Greystone, Middleburg, Kittrell, and Townsville. The first three communities, on the main line of the Seaboard Air Line Railroad, are located on the boundary between the Tar and Roanoke River Basins. Kittrell lies in the Tar River Basin, and Townsville is situated in the Roanoke River Basin.

Rainfall (inches)	46.57
Snowfall (inches)	10.6
Mean annual temperature (degrees)	59.2
Growing season (days)	209
Tobacco (1951 Val.)	$8,552,750
Corn (1951 Val.)	$601,620
Cotton (1951 Val.)	$602,950
Total Land Area (acres)	172,160
Forest Area (acres)	71,100
Population (1940)	29,961
Population (1950)	32,101
Total Tax Val.	$34,000,000
Tax Rate	$1.10

Warren County - This county was formed in 1775 from Bute County and was named in honor of General Joseph Warren, a brave Massachusetts soldier who fell while fighting at Bunker Hill. The Town of Warrenton was laid out in 1779 by William Christmas who planned the State Capitol at Raleigh. For more than half a century before the Civil War, Warrenton was a center of culture, where many prominent statesmen resided. Birthplace of authors Francis Boyd Calhoun and Crichton Thorne, historic Warrenton contains many homes built in pre-Civil War days. Not far from Warrenton is "Buck Spring", home of Nathaniel Macon (1758-1837), Representative and Senator, and one of the most distinguished citizens of the State. Macon served in Congress for 36 years.

In the northeast Piedmont, Warren County is characterized by the

rolling topography of the Central plains. Chief merchantable species of trees in the county are loblolly and shortleaf pine, oak, poplar, hickory, and gum. Waters in the Tar River Basin include Bens, Duncans, Fishing, Little Fishing, Little Shocco, Matthews, Rocky, Shocco, Walters, and other creeks.

The diversified farming in Warren County includes, in addition to tobacco, cotton, and corn which are the chief crops, small grains, cantaloupes, cucumbers, peanuts, sweet and Irish potatoes, wheat, oats, and soybeans. This county is the largest producer of pickling cucumbers in the State. Lumbering is the major industry in the county, with textiles ranking second. There are 43 grade-A dairies in the county.

"Buck Spring", home of Nathaniel Macon, is located near Vaughan. The following points of interest are located in Warrenton (county seat): Emanuel Episcopal Church (1842) where Horace Greeley was married in 1846; the Eaton Place, built in 1843; Major Nat Green House (1850); The Pendleton Place containing paintings and other works of art; Doctor Gloucester House built by a Revolutionary Surgeon; Captain White House built before 1840; Judge John Hall Place (1810), home of Judge Hall, assistant justice of the State Supreme Court (1818-32); and Bragg House built in 1800 by Thomas Bragg, for whose son, General Braxton Bragg, Confederate Army, Fort Bragg is named. The Town of Warrenton owns a hotel and a short railway. Near Norlina, there is a boulder and tablet to John Penn, North Carolina signer of the Declaration of Independence.

Communities include Warrenton (county seat),Norlina, Littleton, Wise, Vaughan, and Macon.

Rainfall (inches)	46.47
Snowfall (inches)	10.6
Mean annual temperature (degrees)	59.2
Growing season (days)	209
Tobacco (1952 Val.)	$5,775,000
Cotton (1952 Val.)	$1,870,000
Livestock (1952 Val.)	$750,000
Total Land Area (acres)	283,500
Forest Area (acres)	148,500
Population (1940)	23,145
Population (1950)	22,539
Total Tax Val.(1952)	$15,191,888
Tax Rate (1952)	$1.28

Watershed Boundary - The boundary line of the Tar River Basin, in a clockwise direction, extends generally as follows:

Beginning at Persimmon Point in the northeastern corner of Pamlico County;

Thence southwest to the divide on the Atlantic Intracoastal Waterway between Gale Creek in Pamlico County and Goose Creek in Beaufort County;

Thence along the Beaufort-Pamlico County line and the Beaufort-Craven County line to Wilmar on U.S. Highway 17;

Thence north on U.S. Highway 17 to its junction with N.C. Highway 102;

Thence generally northwest through Black Jack, McGowans Crossroads, Red Oak Church, California, and Fountain in Pitt County;

Thence northwest, generally parallel to the Edgecombe-Wilson County line, to N.C. Highway 42;

Thence west on N.C. Highway 42 to U.S. Highway 301;

Thence north on U. S. Highway 301 to Rosebud;

Thence west about 2.5 miles, north about five miles, and about one mile west to N. C. Highway 58 on the Nash-Wilson County line;

Thence north and west in Wilson County on N.C. Highways 58 and 95, respectively, and northwest on an un-numbered highway, to the Franklin-Nash County line;

Thence in Nash County generally northwest through Strickland Cross Roads, Stanhope, and Fraziers Cross Roads;

Thence in Franklin County generally northwest through Pilot, Pearces, Harris Cross Roads, Youngsville, and Pocomoke;

Thence in Granville County generally northwest near Wilton, Hester, and Stem to the Person-Granville County line about two miles northeast of Moriah in Person County;

Thence, in Person County, about two miles west, about 12 miles north, and about two miles east to the Person-Granville County line about four miles northwest of Goshen in Franklin County;

Thence, in Granville County, generally southeast through or near Goshen, Satterwhite, Kinton Fork, Lewis, and Huntsboro to the Granville-Vance County line about one mile west of Dabney in Vance County;

Thence, in Vance County, through Dabney, Henderson, Greystone, and Middleburg to Manson in Warren County;

Thence, in Warren County, through Ridgeway, Norlina, Warren Plains, Macon, and Vaughan to Littleton on the Warren-Halifax County line;

Thence, in Halifax County, generally east and southeast, through or near Roger Springs and Pierces Cross Roads, to U. S. Highway 301 about four miles southeast of Halifax;

Thence, southeast on U.S. Highway 301 and north of, and generally parallel to, Beech Swamp, to Roseneath on U. S. Highway 258;

Thence southwest on U. S. Highway 258 to a point about 1.5 miles north of Lawrence in Edgecombe County;

Thence southwest of, and generally parallel to, Etheridge Creek to a point on the Martin-Edgecombe County line about two miles southwest of Hobgood in Halifax County;

Thence along the Martin-Edgecombe County line to an un-numbered highway between Fountain Fork in Edgecombe County and Hassell in Martin County;

Thence in Martin County generally through Hassell, Everetts, and Beargrass to the Martin-Beaufort County line about four miles southeast of Beargrass;

Thence along the Martin-Beaufort and Washington-Beaufort County lines to a point about two miles west of N. C. Highway 32; and

Thence through Van Swamp in Washington County, generally parallel to Welch Creek; southeast in East Dismal Swamp between Lake Phelps and Pungo Lake; and southeast in Hyde County, through the divide on the Atlantic Intracoastal Waterway between Alligator River and Pungo River and between Swanquarter and Hydeland, to the peninsula between West Bluff Bay and East Bluff Bay.

Tar-Pamlico River Basin Streams - There follows a list, alphabetically arranged, of streams in the Tar-Pamlico River Basin in North Carolina, the names of which are shown on available maps. There are numerous streams on such maps, the names of which are not indicated. There are shown, on the following list, the streams into which each of the streams, alphabetically arranged, flows, and also the county in which the junction is located. It is believed that this list will be helpful to interested persons in quickly locating, on a county topographical, or other map, any stream included in the map and also to trace the course of the stream throughout the basin.

STREAM	RECEIVING STREAM	COUNTY IN WHICH JUNCTION OCCURS
Aggie Run	Tranters Creek	Beaufort
Anderson Branch	Tar River	Franklin
Aycock Creek	Tar River	Granville

STREAM	RECEIVING STREAM	COUNTY IN WHICH JUNCTION OCCURS
Back Creek	Bath Creek	Beaufort
Back Swamp	Big Peachtree Creek	Nash
Banjo Creek	Pungo River	Beaufort
Barber Creek	Tar River	Pitt
Basket Creek	Stony Creek	Nash
Bath Creek	Pamlico River	Beaufort
Battles Branch	Fishing Creek	Halifax-Nash
Bear Branch	Sapony Creek	Nash
Bear Creek	Big Peachtree Creek	Nash
Bear Creek	Tar River	Pitt
Bear Grass Swamp	Turkey Swamp	Martin
Bear Swamp	Little Fishing Creek	Halifax
Bear Swamp Creek	Tar River	Franklin
Beaverdam Branch	Big Peachtree Creek	Nash
Beaverdam Swamp	Beech Swamp	Halifax
Beaverdam Swamp	Fishing Creek	Nash
Beech Branch	Tar River	Edgecombe
Beech Swamp	Fishing Creek	Halifax
Bellamys Branch	Fishing Creek	Halifax-Nash
Bells Branch	Tar River	Edgecombe
Bems Creek	Little Fishing Creek	Halifax
Big Branch	Cedar Creek	Franklin
Big Branch	Little Fishing Creek	Warren
Big Peachtree Creek	Stony Creek	Nash
Black Creek	Beaverdam Swamp	Nash
Blount Creek	Pamlico River	Beaufort
Bond Creek	South Creek	Beaufort
Boulding Creek	Fishing Creek	Granville
Brandy Creek	Cedar Creek	Franklin
Bridle Creek	Fishing Creek	Warren
Briery Swamp	Tranters Creek	Pitt
Broad Creek	Pamlico River	Beaufort
Broad Creek	Pantego Creek	Beaufort
Broad Creek	Pungo River	Hyde
Broad Run	Tar River	Pitt
Browns Branch	Tar River	Nash
Buck Branch	Tar River	Edgecombe
Buffalo Creek	Sandy Creek	Franklin
Buffalo Creek	Tar River	Franklin
Buffalo Creek	Tar River	Vance
Burnt Coat Swamp	Beech Swamp	Halifax
Butterwood Creek	Bear Swamp	Halifax
Buzzards Branch	Shocco Creek	Warren
Bynums Mill Creek	Town Creek	Edgecombe
Campbell Creek	Goose Creek	Beaufort
Camping Creek	Cedar Creek	Franklin
Cannon Swamp	Tar River	Pitt
Caswell Branch	Shocco Creek	Warren-Franklin
Cattail Creek	Tar River	Granville
Cedar Creek	Tar River	Franklin
Cherry Run	Tranters Creek	Beaufort
Chicod Creek	Tar River	Pitt
Chocowinity Creek	Chocowinity Bay	Beaufort
Christian Creek	Upper Goose Creek	Beaufort
Clark Creek	Pamlico River	Pamlico
Cockrell Branch	Tar River	Nash

STREAM	RECEIVING STREAM	COUNTY IN WHICH JUNCTION OCCURS
Cokey Swamp	Town Creek	Edgecombe
Collie Swamp	Tranters Creek	Martin
Compass Creek	Tar River	Edgecombe
Conetoe Creek	Tar River	Pitt
Coon Creek	Fishing Creek	Granville
Cow Swamp	Chicod Creek	Pitt
Crisp Creek	Conetoe Creek	Edgecombe-Beaufort
Crooked Creek	Tar River	Franklin
Crooked Swamp	Fishing Creek	Nash
Cub Creek	Tar River	Granville
Cucklers Creek	Pantego Creek	Beaufort
Culpepper Branch	Fishing Creek	Halifax-Nash
Cypress Creek	Tar River	Franklin
Cypress Run	South Creek	Beaufort
Davis Branch	Fishing Creek	Halifax-Nash
Deep Creek	Fishing Creek	Edgecombe
Deep Run	Broad Creek	Beaufort
Deer Branch	Sandy Creek	Franklin
Devils Cradle Creek	Flatrock Creek	Franklin
Dickinson Branch	Tar River	Franklin
Duck Creek	Pamlico River	Beaufort
Dunbar Branch	Tar River	Edgecombe
Duncans Creek	Walkers Creek	Warren
Durham Creek	Pamlico Creek	Beaufort
East Branch	Chicod Creek	Pitt
Eastern Creek	Goose Creek	Pamlico
Farrell Branch	Tar River	Franklin
Fishing Creek	Tar River	Edgecombe
Fishing Creek	Tar River	Granville
Flatrock Creek	Sandy Creek	Franklin
Ford Creek	Tar River	Granville
Ford Branch	Tar River	Nash
Fortescue Creek	Pungo River	Hyde
Fox Creek	Shelton Creek	Granville
Fox Creek	Tar River	Franklin
Gibbs Creek	Tar River	Granville
Gideon Swamp	Swift Creek	Nash
Gills Little Mill Creek	Lynch Creek	Franklin
Goose Creek	Pamlico River	Pamlico
Great Swamp	Johnsons Mill Run	Pitt
Green Mill Run	Tar River	Pitt
Grindle Creek	Tar River	Pitt
Gum Swamp Run	South River	Beaufort
Hachers Run	Fishing Creek	Granville
Hardee Creek	Tar River	Pitt
Harris Creek	Tar River	Pitt
Harts Mill Run	Tar River	Edgecombe
Hawtree Creek	Little Fishing Creek	Halifax
Henry Branch	Sapony Creek	Nash
Hills Creek	Pamlico River	Beaufort
Horse Branch	Chocowinity Creek	Beaufort
Horsepen Swamp	Tranters Creek	Beaufort
Hunting Run	Grindle Creek	Pitt
Jack Creek	Pungo Creek	Beaufort
Jacket Swamp	Beech Swamp	Halifax
Jackson Creek	Tar River	Granville

STREAM	RECEIVING STREAM	COUNTY IN WHICH JUNCTION OCCURS
Jacobs Branch	Tar River	Nash
Jacobs Creek	South Creek	Beaufort
James Creek	Pamlico River	Pamlico
Joes Branch	Ruin Creek	Vance
Johnson Creek	Tar River	Granville
Johnsons Mill Run	Tar River	Pitt
Jordan Creek	Coon Creek	Granville
Jordan Creek	Pungo River	Beaufort
Jumping Run	Tar River	Franklin
Juniper Branch	Chicod Creek	Pitt
Kings Creek	Tar River	Vance
Kitten Creek	Otter Creek	Pitt
Latham Creek	Aggie Run	Beaufort
Lawrence Run	Tyson Creek	Pitt
Lees Branch	Shocco Creek	Warren
Lees Creek	Pamlico River	Beaufort
Lemons Branch	Tar River	Nash
Little Buffalo Creek	Tar River	Vance
Little Cokey Swamp	Cokey Swamp	Edgecombe
Little Fishing Creek	Fishing Creek	Halifax
Little Peachtree Creek	Peachtree Creek	Nash
Little Sapony Creek	Sapony Creek	Nash
Little Shocco Creek	Shocco Creek	Warren-Franklin
Lona Creek	South Creek	Beaufort
Lone Swamp	Swift Creek	Nash
Long Branch	Cypress Creek	Franklin
Long Branch	Fishing Creek	Warren
Long Creek	Tabbs Creek	Vance
Lower Dowery Creek	Pungo River	Beaufort
Lower Spring Creek	Goose Creek	Beaufort
Lynch Creek	Tar River	Franklin
Mabrys Branch	Fishing Creek	Edgecombe-Nash
Maple Branch	Shocco Creek	Warren
Maple Swamp	Fishing Creek	Edgecombe
Marsh Swamp	Beech Swamp	Halifax
Matthews Creek	Fishing Creek	Warren
McGees Creek	Taylors Creek	Franklin
Meadow Branch	Tranters Creek	Pitt
Meltons Branch	Fishing Creek	Halifax-Nash
Middle Creek	Tar River	Franklin
Middle Prong	Pamlico River	Beaufort
Mill Branch	Fishing Creek	Warren
Muddy Creek	Bond Creek	Beaufort
Mullins Branch	Tar River	Franklin
Nevil Creek	Pamlico River	Beaufort
New Branch	Tar River	Edgecombe
Norris Creek	Crooked Creek	Franklin
North Creek	Pamlico River	Beaufort
North Fork Tar River	Tar River	Granville
Old Ford Swamp	Aggie Run	Beaufort
Otter Creek	Tar River	Pitt
Owen Creek	Tar River	Granville
Owens Creek	Fishing Creek	Warren
Oyster Creek	Pamlico River	Pamlico
Pamlico River	Pamlico Sound	Pamlico

STREAM	RECEIVING STREAM	COUNTY IN WHICH JUNCTION OCCURS
Pantego Creek	Pungo River	Beaufort
Parkers Creek	Tar River	Pitt
Peachtree Creek	Stony Creek	Nash
Phoebes Creek	Fishing Creek	Warren
Pine Log Branch	Beaverdam Swamp	Nash
Poplar Creek	Tabbs Creek	Granville
Porter Creek	Durham Creek	Beaufort
Possumquarter Creek	Fishing Creek	Warren
Powells Creek	Little Fishing Creek	Halifax
Pungo Creek	Pungo River	Beaufort
Pungo River	Pamlico River	Hyde-Beaufort
Ransoms Branch	Fishing Creek	Halifax-Nash
Red Bud Creek	Ruin Creek	Vance
Red Bud Creek	Sandy Creek	Nash
Reedy Creek	Little Fishing Creek	Halifax
Richneck Creek	Fishing Creek	Warren
Rock Branch	Matthews Creek	Warren
Rocky Creek	Fishing Creek	Warren
Rodman Creek	Pamlico River	Beaufort
Rossers Branch	Fishing Creek	Halifax-Nash
Ruin Creek	Tabbs Creek	Vance
Runyan Creek	Pamlico River	Beaufort
Sandy Creek	Swift Creek	Nash
Sapony Creek	Tar River	Nash
Sattherwaite Creek	Pungo River	Beaufort
Shelton Creek	Tar River	Granville
Shocco Creek	Fishing Creek	Warren-Granville
Simms Branch	Tar River	Franklin
Singleton Swamp	Old Ford Swamp	Beaufort
Slade Creek	Pungo River	Hyde
Smith Creek	Pungo River	Hyde
Snodes Creek	Goose Creek	Beaufort
South Creek	Pamlico River	Beaufort
St. Clair Creek	Pamlico River	Beaufort
Stony Creek	Tar River	Nash
Strickland Branch	Tar River	Nash
Swift Creek	Tar River	Edgecombe
Sycamore Creek	Tar River	Franklin
Tabbs Creek	Tar River	Vance
Tar River	Pamlico River	Pitt-Beaufort
Taylors Creek	Tar River	Franklin
Tokey Creek	Tar River	Edgecombe
Town Creek	Tar River	Edgecombe
Tranters Creek	Tar River	Pitt-Beaufort
Tumbling Run	Sandy Creek	Nash
Turkey Creek	Tar River	Nash
Turkey Swamp	Tranters Creek	Martin
Tyson Creek	Tar River	Pitt
Upper Dowery Creek	Pungo River	Beaufort
Upper Goose Creek	Pamlico River	Beaufort
Upper Spring Creek	Goose Creek	Pamlico
Walkers Creek	Little Fishing Creek	Warren
Weaver Creek	Sandy Creek	Vance
Webbs Branch	Tar River	Nash
Whiteoak Swamp	Fishing Creek	Nash
Whiteoak Swamp	Swift Creek	Edgecombe

STREAM	RECEIVING STREAM	COUNTY IN WHICH JUNCTION OCCURS
Wilkerson Creek	Pungo River	Hyde
Winstead Branch	Tar River	Nash
Wolfpen Branch	Tar River	Franklin
Wright Creek	Pungo River	Beaufort

"Progress Report No. 1, Public Surface-Water Supplies in North Carolina, Descriptions and Chemical Character, U. S. Geological Survey, Raleigh, 1947", prepared in cooperation with the State Board of Health, contains the following information regarding public surface-water supplies in the Tar River Basin. Ownership is municipal unless otherwise indicated.

Franklinton, Franklin County

Population- 1940: 1,273 (1950: 1,414)
Supplies also about 1,000 people outside of city limits.
Source: Kearneys Creek impounded in town reservoir.
Treatment - Coagulation with alum and soda ash, rapid sand filtration, chlorine, final adjustment of pH with lime.
Sample collected May 23, 1946

Color	7		
pH	7.5	Bicarbonate	36
Silica	15	Sulfate	9.9
Iron	0.03	Chloride	4.5
Manganese	0.0	Fluoride	0.1
Calcium	11	Nitrate	0.2
Magnesium	1.2	Dissolved solids	69
Na + K	6.5	Total hardness	32

Greenville, Pitt County

Population - 1940: 12,674 (1950: 16,724)
Source - Tar River
Treatment - coagulation with alum, ammonia, chlorine, rapid sand filtration, final adjustment of pH with lime.
Sample collected January 24, 1946

Color	2		
pH	-.	Bicarbonate	21
Silica	8.6	Sulfate	19
Iron	0.05	Chloride	5.0
Manganese	0.0	Fluoride	0.0
Calcium	11.	Nitrate	0.6
Magnesium	1.5	Dissolved solids	65
Na plus K	5.0	Total hardness	34

Henderson, Vance County

Population - 1940: 7,647 (1950: 10,996).
Supplies also about 5,000 people outside of city limits.
Source - East Sandy Creek impounded.
Treatment - Coagulation with alum and soda ash, chlorine, rapid sand filtration, chlorine.
Sample collected March 8, 1946

Color	3	Bicarbonate	7.0
pH	6.3	Sulfate	21
Silica	7.2	Chloride	6.5
Iron	0.06	Nitrate	1.3
Calcium	2.5	Dissolved solids	66
Magnesium	1.2	Total hardness	11
Na + K	12		

Louisburg, Franklin County

Population - 1940: 2,309 (1950: 2,545).
Supplies also about 60 people outside of city limits. Consumption is about 320,000 gallons per day.
Source - Tar River.
Treatment - Coagulation with alum and lime, rapid sand filtration, chlorine.
Sample collected June 10, 1946.

Color	5		
pH	7.2	Bicarbonate	16
Silica	15	Sulfate	26
Iron	0.13	Chloride	5.8
Manganese	0.05	Fluoride	0.0
Calcium	6.8	Nitrate	0.4
Magnesium	2.7	Dissolved solids	78
Na + K	9.5	Total hardness	28

Oxford, Granville County

Population - 1940: 3,991 (1950: 6,685).
Supplies also about 3,000 people outside of city limits.
Source - Tar River
Treatment - Coagulation with alum, rapid sand filtration, chlorine, final adjustment of pH with lime.
Sample collected June 28, 1946.

Color	4	Bicarbonate	41
pH	8.0	Sulfate	19
Silica	11	Chloride	4.9
Iron	0.03	Fluoride	0.1
Calcium	16	Nitrate	0.3
Magnesium	2.2	Dissolved solids	83
Na plus K	5.5	Total hardness	49

Rocky Mount, Nash County - Edgecombe County

Population - 1940: 25,568 (1950: 27,697).
Source - Tar River
Treatment - Coagulation with alum, activated carbon, rapid sand filtration, calgon, ammonia, chlorine, final adjustment of pH with lime.
Sample collected May 8, 1944.

Color	3	Bicarbonate	26
Silica	14	Sulfate	13
Iron	0.04	Chloride	4.2
Calcium	8.3	Fluoride	0.2
Magnesium	1.7	Nitrate	0.4
Na + K	6.4	Dissolved solids	67
		Total hardness	28

Tarboro, Edgecombe County

Population - 1940: 7,148 (1950: 8,120).
Supplies also about 500 people outside of city limits.
Source - Tar River.
Treatment - Coagulation with alum and lime, ammonia, chloride, rapid sand filtration, chlorine, final adjustment of pH with lime.
Sample collected April 26, 1946.

Tarboro (cont'd.)

Color	2	Bicarbonate	33
pH	8.0	Sulfate	15
Silica	12	Chloride	7.2
Iron	0.03	Nitrate	0.3
Na + K	7.0	Dissolved solids	76
Calcium	12	Total hardness	38
Magnesium	1.9		

The following material is taken from "Progress Report No. 2, Descriptions and Chemical Character, Public Ground-Water Supplies in North Carolina, Raleigh, 1949", prepared in cooperation with the State Board of Health. Ownership is municipal unless otherwise indicated.

Battleboro, Nash County - Edgecombe County

Population - 1940: 270 (1950: 329)
Source - Well
Depth of well (ft.) - 280
Diameter of well (in.) - 6
Yield (g.p.m.) - 32
Sample collected June 30, 1949
Treatment - None

Color	2	Bicarbonate	264
pH	7.6	Sulfate	6.4
Silica	24	Chloride	9.8
Iron	0.11	Fluoride	0.3
Calcium	39	Nitrate	0.4
Magnesium	9.5	Dissolved solids	264
Na + K	47	Total hardness	136

Nashville, Nash County

Population - 1940: 1,171 (1950: 1,302)

Source - Two wells	Well 1	Well 2	Manganese	0.05	0.52
Depth of well (ft.) -	300	250	Calcium	0.0	0.45
Diameter of well (in.)	8	8	Magnesium	16	15
Yield (g.p.m.)	250	500	Na + K	5.5	1.0
Sample collected	3/11/47	3/11/47	Bicarbonate	13	11
Treatment	none	none	Sulfate	87	66
Color	9	13	Chloride	11	2.6
Silica	7.8	6.8	Fluoride	0.2	0.2
Iron	19	36	Total		
Dissolved solids	109	106	Hardness	62	42

Pinetops, Edgecombe County

Population - 1940: 713 (1950: 1,031)
Source - Two wells

	Well 1	Well 2	Iron	0.79	0.36
Depth of well (ft.)	149	155	Calcium	24	22
Diameter (ft.)	8	8	Magnesium	3.5	3.9
Yield (g.p.m.)	60	80	Na + K	15	16
Sample collected	9/15/47	9/15/47	Bicarbonate	115	114
Treatment	none	none	Sulfate	8.1	8.2
Color	7	6	Chloride	3.0	3.0
pH	6.8	6.9	Floride	0.2	0.2
Silica	32	33	Nitrate	2.0	0.0
Dissolved solids	145	142	Total hardness	74	71

Bethel, Pitt County

Population - 1940: 1,333 (1950: 1,402)
Source - Two wells

	Well 1	Well 2			
Depth of well (ft.)	378	376	Calcium	7.4	3.6
Diameter of well(in.)	8	8	Magnesium	0.9	1.1
Yield (g.p.m.)	350	200	Na + K	10	13
Samples collected	7/11/49	7/11/49	Bicarbonate	25	4
Treatment	None	None	Sulfate	6.2	7.5
Color	2	2	Chloride	11	19
pH	6.0	5.4	Fluoride	0.1	0.1
Silica	13	11	Nitrate	1.7	4.6
Iron	0.36	0.30	Dissolved solids	64	66
Manganese	0.0	0.03	Total hardness	22	14

Enfield, Halifax County

Population - 1940: 2,208 (1950: 2,361)
Source - nine wells
Depth of wells (ft.) - 40 - 60
Diameter of wells (in.) - 4 - 8
Yield (g.p.m.) - 200
Samples collected - 2-3-48
Treatment -None

Color	3	Bicarbonate	232
pH	7.3	Sulfate	158
Silica	12	Chloride	124
Iron	0.24	Fluoride	0.4
Calcium	53	Nitrate	1.1
Mangesium	18	Dissolved solids	646
Na + K	150	Total hardness	206

Robersonville, Martin County

Population - 1940: 1,407 (1950: 1,414)
Source - two wells

	Well 1	Well 2			
Depth of well(ft.)	400	400	Magnesium	1.6	3.7
Diameter of well(in.)	10	10	Na + K	162	386
Yield (g.p.m.)	500	500	Bicarbonate	401.	444
Sample collected	2/16/48	2/16/48	Sulfate	8.4	156
Treatment	none	none	Chloride	16.	235.
Color	3	2	Fluoride	0.9	0.9
pH	7.8	7.8	Nitrate	0.4	0.2
Silica	23	22	Dissolved solids	420	1047
Iron	0.43	0.39	Total hardness	10	20
Calcium	1.4	2.0			

Spring Hope, Nash County

Population - 1940: 1,222 (1950: 1,275)
Source - two wells

	Well 1	Well 2			
Depth of well (ft.)	502	187	Treatment	None	None
Diameter of well (in.)	8	6	Color	7	6
Yield (g.p.m.)	80	75	pH	7.4	6.3
Sample collected	7/15/47	7/15/47	Silica	27	40

Spring Hope (cont'd.)

	Well 1	Well 2			
Iron	0.08	0.09	Chloride	3.1	16
Calcium	25	12	Fluoride	0.1	0.1
Magnesium	4.8	3.2	Nitrate	0.1	2.4
Na + K	10	15	Dissolved solids	131	130
Bicarbonate	114	60	Total hardness	80	43
Sulfate	4.2	1.9			

Warrenton, Warren County

Population - 1940: 1,147 (1950: 1,166)
Source - two wells

	Well 1	Well 2			
Depth of well (ft.)	500	500			
Diameter of well (in.)	10	10			
Yield (g.p.m.)	100	100	Na + K	15	22
Samples collected (raw water)	12/20/46	12/20/46	Bicarbonate	42	89
			Sulfate	23	18
Treatment (both wells)	Chlorination, lime, aeration, & filtration		Chloride	24	9.2
			Dissolved solids	144	151
Color	5	17			
pH	7.4	7.1	Total hardness	61	59
Silica	33	36			
Iron	0.43	0.84	Fluoride	0.1	0.8
Manganese	0.0	0.25			

Washington, Beaufort County

Population - 1940: 8,569 (1950: 9,698)
Source - 23 wells. Surface water used as an auxiliary supply.

	Well 3	22 wells
Depth of wells (ft.)	105	40-170
Diameter of wells (in.)	18	3-8
Yield (g.p.m.)	350	560
Samples collected	4/7/47 (raw water)	1/23/46 (treated water)
Treatment	Chlorination	Lime, filtration, and chlorination
Color	6	6
pH	7.6	8.0
Silica	12	14
Iron	0.26	0.14
Calcium	72	50
Magnesium	1.9	5.8
Na + K	31	54
Bicarbonate	154	182
Sulfate	35	31
Chloride	64	58
Fluoride	0.0	0.3
Nitrate	2.6	2.2
Dissolved solids	330	310
Total hardness	187	149

Whitakers, Nash County-Edgecombe County

Population - 1950: 883 (1950: 962)
Source - 30 wells
Depth of wells (ft.) - 28
Diameter of wells (in.) - 3
Yield (g.p.m.) - 72

Samples collected	3-22-49 (raw water)	3-22-49 (treated water)
Treatment	none	Chlorination, aeration, lime, sedimentation, and filtration.
Color	2	2
pH	5.8	9.6
Silica	22	23
Iron	6.5	0.09
Manganese	0.11	0.0
Calcium	9.0	17
Magnesium	1.4	1.4
Na + K	9.5	10
Bicarbonate	17	14-34
Sulfate	20	20
Chloride	10	15
Nitrate	0.1	0.1
Dissolved solids	83	103
Total hardness	28	48

Youngsville, Franklin County

Population - 1940: 553 (1950: 619)
Source - well
Depth of well (ft.) - 245
Diameter of well (in.) - 8
Yield (g.p.m.) - 75
Sample collected - 2/5/46
Treatment - none

Color -	2		
pH	7.0	Bicarbonate	103
Silica	31	Sulfate	12
Iron	6.1	Chloride	2.9
Manganese	0.05	Fluoride	0.1
Calcium	18	Nitrate	0.1
Magnesium	6.7	Dissolved solids	134
Na plus K	13	Total hardness	72

The following information regarding public ground-water supplies in the Tar River Basin is taken from "Bulletin No. 51, Ground Water in the Halifax Area, North Carolina, by M. J. Mundorff, Raleigh, 1946", prepared in cooperation with the United States Geological Survey. The Halifax Area includes Edgecombe, Halifax, Nash, Northampton, and Wilson Counties.

Edgecombe County - Tarboro and Pinetops have the only municipal supplies in Edgecombe County with the exception of Rocky Mount, Battleboro, and Whitakers which are described hereinafter under "Nash County" because the sources of these supplies are in that county.

Pinetops (with populations of 713 and 1,031 in 1940 and 1950, respectively) has had a municipal supply since 1926, obtaining its water from two drilled

wells. . . The water comes from a sand stratum in the Cretaceous deposits, and the wells yield about 75 gallons a minute each. The wells are equipped with deep-well turbine pumps, capable of pumping 50 gallons a minute each, which discharge directly into the mains. A 75,000-gallon, elevated tank supplies storage with a maximum pressure of about 50 pounds to the mains. The average consumption is about 50,000 gallons a day, and the water is not treated.

Tarboro (with populations of 7,148 and 8,120 in 1940 and 1950, respectively) has had a municipal supply since 1888 or 1889. From that date until 1897, the water was taken from Hendricks Creek and was used only for fire protection. In 1897, wells were drilled, and a distribution system was installed to supply the inhabitants. In 1912, just prior to abandoning the well-water supply, 14 wells, 50 to 100 feet deep and 4 to 8 inches in diameter, were used. These wells were pumped by a single vacuum-pump, yielding about 85 gallons per minute. The deeper wells overflowed, and the pressure was reported to have been sufficient to raise the water 16 feet above the bed of Hendricks Creek. From 1912 to the present time, Tarboro has obtained its water supply from the Tar River. The water is pumped from the river by three electrically-driven centrifugal pumps with a total capacity of 2,950 gallons a minute. It is treated by pre-chlorination and the addition of lime and alum, and then is filtered. Secondary lime, ammonia, calgon, and chlorine are added after filtering. Three booster pumps, two electrically-driven and one gasoline-driven, with a total capacity of 2,750 gallons a minute, are used to distribute the water. Storage is provided by two concrete reservoirs, one of 1,000,000-gallon and one of 275,000-gallon capacity, and two 100,000-gallon, elevated tanks. The pressure is maintained at about 64 pounds at the plant, and the pressure at fire hydrants is about 60 pounds. The capacity of the plant is about 1,500,000 gallons a day, and maximum consumption is about 500,000 gallons a day. Average consumption is about 400,000 gallons a day, of which about 25 percent is used by industry.

Halifax County - Enfield (with populations of 2,208 and 2,316 in 1940 and 1950, respectively) has had a municipal water-supply since 1923. The water is obtained from three shallow, gravel-walled wells, eleven shallow wells and one deep well. (Apparently, from the information regarding Enfield, set forth hereinbefore under "Progress Report No. 2, etc.", six wells for the town's water supply ceased to be used between 1946 and 1949.) The shallow wells yield water from a sand strata near the base of the Sunderland formation, and the deep well yields water from the crystalline bedrock which is apparently a schist. The combined yield of the 14 shallow wells is 100 gallons a minute. The deep well is not used, except in case of emergency, because of the excessive hardness of the water. It appears, however, that the mineral content of the water is decreasing as the well is pumped, and it is possible that this water will eventually be satisfactory for municipal use. The 14 shallow wells discharge into a 150,000-gallon, round concrete-reservoir, from which the water is pumped into the mains. The deep well discharges directly into the mains. A 100,000-gallon, elevated tank, connected to the mains, serves as an additional storage and maintains uniform pressure. Maximum pressure is about 55 pounds. The water is not treated. Consumption averages about 75,000 gallons a day. (The other five municipalities, under "Halifax County" in "Bulletin No. 51", are in the Roanoke River Basin.)

Nash County - The public supply at Battleboro (with populations of 270 and 329 in 1940 and 1950, respectively), which was installed in 1942, is obtained from a drilled well, 250 feet deep. It yields 25 gallons a minute and is pumped with a deep-well turbine pump that discharges directly into the distribution system. A 75,000-gallon, elevated tank is interconnected in the system and serves as storage and to equalize the pressure, which varies between 40 and 55 pounds. A well at the Battleboro Cotton Mill is connected with the distribution system and can be used in emergencies. Average consumption is about 6,000 gallons a day.

The water is not treated. . . .

Nashville (with populations of 1,171 and 1,302 in 1940 and 1950, respectively) has had a city supply since 1915. The source is two drilled wells which yield 300 and 55 gallons a minute, respectively. (The yields of these two wells are indicated, hereinbefore under "Progress Report No. 2, etc.", as 250 and 500 gallons a minute, respectively.) They are both equipped with deep-water turbine pumps. The pump at one well discharges directly into the mains at the rate of 250 gallons a minute. A 60,000-gallon, elevated tank is connected with the distribution system for storage and to maintain a uniform pressure. The other well, used as an auxiliary supply, discharges into a 110,000 gallon, round concrete-tank at ground level. Three pumps are available to force the water from the concrete reservoir into the distribution system. The water pressure in the system ranges from 40 to 50 pounds. Consumption averages about 50,000 gallons a day. The only treatment consists of the addition of sodium hydroxide directly into the distribution at one well. (Analysis of the untreated water from this well is shown on page 57 of "Bulletin 51".)

Rocky Mount (with populations of 25,568 and 27,697 in 1940 and 1950, respectively) has had a municipal supply since 1898. From 1898 to 1908, the water was taken from Stony Creek. Since 1909, supply has been obtained from Tar River. The pumping and treatment plant is on the bank of the river at the western edge of the city. After treatment with alum, lime, and charcoal, the water is filtered and settled, and then ammonia and chloride are added. Clear-water storage consists of one 150,000-gallon reservoir and one 500,000-gallon reservoir. Two electrically-driven pumps and one gasoline-driven pump force the water into the main. A 1,000,000-gallon, elevated tank, in the eastern part of the city, serves as additional storage and to maintain pressure on the mains which ranges from 50 to 55 pounds. The capacity of the plant is 6,750,000 gallons a day. Maximum and average consumptions are about 2,500,000 and 2,000,000 gallons a day, respectively. About 50 percent of the water is used by industries.

Spring Hope (with populations of 1,222 and 1,275, respectively) has had a municipal water-supply since 1920. The water is obtained from two drilled wells which have capacities of 155 and 80 gallons a minute. (The yields of these wells are indicated, hereinbefore under "Progress Report No. 2, etc.", as 75 and 80 gallons a minute.) Both are equipped with deep-well turbine pumps which discharge directly into the distribution system. A 100,000-gallons, elevated tank is the only storage. Pressure varies between 40 and 45 pounds, and consumption averages about 75,000 gallons a day. The water is not treated.

The water supply of the Town of Whitakers (with populations of 883 and 962 in 1940 and 1950, respectively) was installed in 1937. A number of test wells were drilled with poor results. One of these wells was drilled to 405 feet. Another well was completed satisfactorily and tested at 40 gallons a minute for 36 hours. However, after using this well for several years, the yield decreased, and it was found necessary to provide more water. The present supply consists of 30 wells in three lines 50 feet apart. The wells are about 20 feet apart in each line. They are 1.5 inches in diameter and average about 27.5 feet in depth. ("Progress Report No. 2, etc." indicates this diameter as 3 inches.) They were jetted down, using a jetted point with a screen. The yield of the individual wells is reported to have been 18 to 40 gallons a minute each, but the total combined yield for the field was 90 gallons a minute on a 36-hour test. These wells were put in service in 1941. The well-field is pumped with a piston-vacuum pump at the pumping and treatment plant. Treatment consists of pre-chlorination, aeration, addition of lime and alum, settling, and filtering. A centrifugal pump, with a capacity of 75 gallons a minute, forces the water into

the distribution system. A 75,000-gallon, elevated tank, near the center of town, serves as storage and to maintain the pressure, which averages about 50 pounds. Maximum and average consumptions are about 50,000 gallons and about 20,000-gallons a day, respectively. (The other two municipalities, under "Nash County" in "Bulletin No. 51", are in the Neuse River Basin.)

Data regarding Agricultural Production - Information regarding farm population, total land in farms, harvested croplands, idle cropland, and use of fertilizer, according to the 1952 Farm Census of 1951 crops, for the counties within or partially within the Tar River Basin (excluding Person, Martin, and Wilson Counties which have small areas in the basin), is shown below. The figures are in acres unless otherwise indicated.

ITEM	Beaufort	Edgecombe	Franklin	Granville	Halifax	Nash	Pitt	Vance	Warren	Total
Harvested Cropland	107,696	136,694	87,140	68,553	140,280	134,446	164,771	42,484	59,967	942,031
Idle Cropland	4,941	7,204	17,466	13,566	12,816	5,180	3,421	6,782	11,925	83,301
Pasture	8,115	11,104	16,525	23,714	24,598	12,770	10,361	10,513	17,411	135,111
Woods, Home Sites,etc.	182,852	150,394	171,229	183,724	229,475	166,981	188,401	80,391	153,492	1506,939
Corn Harvested	40,398	48,259	26,507	24,267	40,627	48,651	77,154	12,169	15,299	333,331
Cotton Harvested	2,594	20,402	15,106	556	32,991	22,714	12,585	4,369	12,172	123,489
Tobacco Harvested	14,372	17,953	18,062	19,830	9,507	28,517	89,084	12,206	9,496	219,027
Peanuts	1,109	22,349	- -	- -	38,424	4,253	9,104	- -	539	75,778
Wheat	460	1,081	2,860	1,823	1,785	3,239	529	1,502	4,809	18,088
Oats	6,625	2,749	1,290	735	2,103	4,462	3,192	748	2,007	23,911
Other Small Grains	330	90	493	387	417	1,087	444	489	613	4,350
Soybeans	31,352	13,641	2,398	178	6,160	3,861	6,455	549	1,163	65,937
Lespedeza	3,905	913	385	247	1,437	297	193	94	291	7,762
Hay Crops Harvested	5,596	5,234	15,813	14,488	3,640	14,586	9,299	7,967	11,222	87,845
Other Hays Cut	822	594	494	2,670	1,287	1,636	207	878	1,924	10,512
Irish Potatoes	1,802	467	393	381	495	550	830	233	287	5,438
Sweet Potatoes	660	700	545	355	754	837	1,127	228	307	5,513
Other Vegetables Grown	496	323	393	300	757	262	1,193	229	1,117	5,070
Other Crops Harvested	1,791	1,853	2,521	2,187	2,829	3,692	2,246	1,838	1,396	20,353
Total Land in Farms	303,604	305,296	292,360	289,557	407,169	319,287	366,062	140,419	242,795	2666,549
Total Land Area	531,840	309,056	316,160	347,520	462,080	353,280	419,840	172,160	283,500	3139,636
Comm.Fert. Used, Tons	23,225	31,223	22,247	18,491	29,553	41,048	47,805	12,684	13,838	240,114
Sows and Gilts, No.	2,850	2,664	970	594	4,338	6,266	6,022	488	1,030	25,222
Cows and Heifers, No.	3,610	4,939	4,139	6,266	5,686	4,125	3,942	2,791	5,421	40,919
Hens and Pullets, No.	89,420	77,636	79,892	69,416	79,765	165,370	168,797	50,721	49,796	830,813
Tractors in Usable condition, No.	1,575	1,084	931	786	1,109	1,433	1,739	417	490	9,564
Farm Population, No.	15,601	20,843	22,041	18,011	25,337	32,616	30,842	13,061	15,626	193,978
Total Population, 1940, No.	36,431	49,162	30,382	29,344	56,512	55,608	61,244	29,961	23,145	371,789
Total Population, 1950, No.	37,134	51,634	31,341	31,793	58,377	59,919	63,789	32,101	23,539	389,627

Permits to Use Water for Irrigation - The following permits to use surface waters in the Tar River Basin for the purpose of irrigation have been issued by the Director of the Department of Conservation and Development in accordance with the provisions of Section 113-8.1, General Statutes of North Carolina, as amended:

Permit No.	Name	Address	Source	Amount (c.f.s.)
	Beaufort County			
476	C.L. & M.H.Godley	Grimesland	Bear Creek	0.99
	Edgecombe County			
14	R.R. Brake, Jr.	R#1, Battleboro	Tar River	0.70
481	N.F. Howard	Box 341, Tarboro	Deep Creek	1.78
482	N.F.Howard	Box 341, Tarboro	Cabin Branch	1.78
393	H.H. Simons	R#1, Tarboro	Mitchell Swp. Canal	2.39
621	Mrs.L.A. Gay	R#4, Rocky Mt.	Little Cokey Swp	0.76
74	Hassell Thigpin	Tarboro	Mitchel Swp. Canal	2.39
	Franklin County			
380	Stephen Wiggins	R#1, Louisburg	Crooked Cr.	0.72
211	J. R. Clifton	R#1, Louisburg	Crooked Cr.	0.37
248	R. L. Ward	R#1, Louisburg	Crooked Cr.	0.30
350	C.C. Bailey	R#2, Zebulon	Br. of Norris Cr.	0.61
345	J. T. Bullock	R#2, Zebulon	Br. of Norris Cr.	0.88
344	B. M. Johnson	R#2, Zebulon	Norris Creek	0.88
348	Mrs. Mattie Bullock	R#2, Zebulon	Norris Creek	0.88
351	Douglas Seymour	R#2, Zebulon	Norris Creek	1.91
416	Charlie Dickens	R#1, Franklinton	Campus & Cedar Crs.	0.67
382	L. J. Peoples	R#1, Louisburg	Br. of Tar R.	0.67
342	Willie Jeffries	R#4, Louisburg	Tar River	0.75
599	B.R.&J.W. Alford	R#4, Louisburg	Tar River	0.52
346	N.J. Vollmer	R#4, Louisburg	Tar River	0.91
379	Jack Ferguson	R#1, Louisburg	Br. of Wolfpen Br.	0.32
400	John Pernell	R#4, Louisburg	Br. of Sycamore Cr.	0.48
149	O.D. Ellis	R#2, Louisburg	Sandy Creek	0.68
745	W. E. Aycock	R#1, Kittrell	Lynch's Creek	0.73
763	Mrs. G. G. Stainback	R#1, Youngsville	Br. of Crooked Cr.	0.42
834	Booster White	R#1, Louisburg	Br. of Camping Cr.	0.24
846	Mrs. Marguerite Washington	401 Sunset Ave., Louisburg	Norris Creek	0.80
851	Maurice Ayscue	R#2, Henderson	Sandy Cr.	1.14
870	T. H. Weldon, Jr.	R#1, Henderson	Buffalo Cr.	1.25
871	T. H. Weldon, Jr.	R#1, Henderson	Apple Creek	1.25
	Granville County			
515	J. P. Hall	Pinecone Dr.,Oxford	Br. of Jordan Cr.	0.37
315	C. R. Sherman	Oxford	Br. of Tabbs Cr.	0.49
	Halifax County			
617	T.C. Williams	R#1, Essex	Br. of Little Fishing Cr.	0.81
618	J.E. Lee	R#1, Essex	Br. of Little Fishing Cr.	0.36
678	A.L. Capps	Box 92, Warrenton	Br. of Little Fishing Cr.	1.07
296	C.D. Moss	R#2, Enfield	Br. of Little Fishing Cr.	0.78
378	W.G. Lynch	Roanoke Rapids	Br. of Little Fishing Cr.	0.32
295	C.D. Moss	R#2, Enfield	Rocky Swp.&Jack Horse Br.	0.78

Nash County

Permit No.	Name	Address	Source	Amount (c.f.s.)
387	E. M. Burris	R#3, Spring Hope	Tar River	0.60
665	D.L. Johnson	Bailey	Tar River	0.73
145	W.O. Baker	R#4, Rocky Mount	Tar River	0.98
140	B.S. Harrison	R#1, Rocky Mount	Tar River	1.12
10	R.D. Gorham	1612 Waverly St., Rocky Mount	Tar River	0.69
141	B. S. Harrison	R#1, Rocky Mount	Maple Creek	1.12
206	J.K. Bridgers	Nashville	Stony Creek	1.12
224	R. L. Vaughan	Nashville	Stony Creek	1.85
566	F. B. Cooper, Jr.	Nashville	Pig Basket Cr.	0.76
600	D.H. Griffin	Box 447, Nashville	Sherrods Cr.	1.96
601	J.S. Smith	Box 393, Nashville	Br. of Sapony Cr.	0.48
443	J.M. Bone	Box 1283, Rocky Mt.	Sapony Creek	0.75
212	R.W. Bone	R#3, Nashville	Sapony Creek	1.37
146	W.O. Baker	R#4, Rocky Mt.	Sapony Creek	0.98
50	W. R. Mann	R#2, Whitakers	Swift Creek	2.10
184	Planters National Bank & Trust Co.	Rocky Mount	Swift Creek	1.50
751	Calvin M. Horne	R#2, Elm City	Tar River	0.74
863	A.C. Mims	R#3, Rocky Mt.	Tar River	1.10

Pitt County

463	R. B. Tyler	R#1, Fountain	Gin Mill Br.	1.14
18	J.D. Hice	Box 111, Greenville	Br. of Johnsons Mill Run	0.49
301	J. L. Harris	R#6, Greenville	Johnsons Mill Run	0.75
130	Roscoe Barnhill	R#5, Greenville	Grindle Cr.	1.33
494	Stewart Joyner	R#2, Farmville	Grindle Cr.	1.14
406	L. M. Mills	R#3, Greenville	Tar River	0.68
19	Rufus Buck	R#1, Grimesland	Tar River	0.91
386	W. B. McLawhorn	Grimesland	Chicod Cr.	0.69
571	J.P. Wilson	Grimesland	Chicod Cr.	0.98
568	Jamie Dail	Grimesland	Chicod Cr.	1.71
862	J.A. Moore, Agent	Fountain	Tyson Creek	2.09

Vance County

692	H.F. Jones	R#1, Kittrell	Br. of Buffalo Cr.	0.33
657	Carson Abbott	445 Burch St., Henderson	Br. of Sandy Cr.	0.95
646	J.B. Hughes	R#2, Henderson	Sandy Creek	1.02
613	Gray Faulkner	R#1, Henderson	Br. of Sandy Cr.	0.74
694	J.E. Parks	R#4, Henderson	Br. of Sandy Cr.	0.92
373	C.E. Jeffcoat	220 Winder St., Henderson	Sandy Creek	0.97
656	Hubert O. Hoyle	R#1, Henderson	Sandy &Weaver Crs.	0.72
542	O. H. Hoyle	R#2, Henderson	Br. of Weaver Cr.	0.99
609	A. C. Hoyle	R#2, Henderson	Br. of Weaver Cr.	0.76
693	W. E. Garrett	R#1, Kittrell	Br. of Tar River	0.11
719	Gray Faulkner	R#1, Henderson	Br. of Sandy Cr.	0.84
842	Allison Faulkner	R#1, Henderson	Leach Branch	0.76
847	D. T. Ayscue	R#1, Henderson	Sandy Creek	0.76
848	H. W. Edwards	R#1, Henderson	Br. of Sandy Cr.	0.46
849	Ronald Smith	R#4, Henderson	Gill's Little Mill Cr.	1.07
850	James T. Finch	R#1, Henderson	Sandy Creek	0.56
857	R. C. Daniel	R#2, Henderson	Weaver Creek	0.34
865	M.H. Robertson	R#2, Henderson	Weaver Cr.	0.66
867	J.E. Robertson	R#2, Henderson	Weaver Cr.	0.90
862	W.C. Stevenson	R#3, Henderson	Ruin Creek	0.32

Warren County

Permit No	Name	Address	Source	Amount (c.f.s.)
361	A.C. Coghill	R#2, Henderson	Sandy Creek	0.41
624	T.J. Harrington	R#2, Henderson	Br. of Sandy Cr.	1.02
698	A. L. Capps	Box 92,Warrenton	Br. of Fishing Cr.	1.07
699	A. L. Capps	Box 92, Warrenton	Br. of Fishing Cr.	1.07
700	A.L. Capps	Box 92, Warrenton	Br.of Little Fish.Cr.	1.07
701	A. L. Capps	Box 92,Warrenton	Br. of Fishing Cr.	1.07

Wilson County

546	G.W. Summerlin	Elm City	Br. of Cattail Swp.	0.32

CHAPTER IV - USE OF WATER FOR INDUSTRIAL PURPOSES

Surface Water - As hereinbefore indicated in Chapter II, the average consumption of water from the Tar River by the municipal supply of the Town of Tarboro is about 400,000 gallons a day, of which about 25 percent is used by industry, and the average consumption from the Tar River by the municipal supply of the City of Rocky Mount is about 2,000,000 gallons a day, of which about 50 percent is used by industries.

Ground Water - "Bulletin No. 51, Ground Water in the Halifax Area, North Carolina, by M. J. Mundorff", prepared in cooperation with the United States Geological Survey and published by the North Carolina Department of Conservation and Development, contains the following information regarding wells, in the Tar River Basin, used for the purpose of supplying water to industries.

Edgecombe County

Whitakers

Davenport & Bland Lumber Co.
- Type of well-jetted
- Depth of well - 20 feet
- Geologic formation - Sunderland
- Chief aquifer - Sand
- Yield (two wells) - 20 g.p.m.

Speed

John Lane Pure Oil Station
- Type of well - drilled
- Depth of well - 100 feet
- Diameter of well - 4.25 inches
- Geologic formation - Cretaceous
- Chief aquifer - Sand
- Depth to water level - 3 feet
- Yield - 6 g.p.m.

Rocky Mount

Colonial Ice Co.
- Type of well - drilled
- Depth of well - 90 (?) feet
- Diameter of well - 8 inches
- Depth to water level - 2 feet
- Yield - 100 g.p.m.
- Remarks - used for cooling

Meadowbrook Dairy
- Type of well-drilled
- Depth of well - 131 feet
- Diameter of well - 6 inches
- Chief aquifer - granite
- Depth to water level - 9 feet (approx.)
- Yield - 30 g.p.m.
- Remarks - Cased 45 feet. Yielded 20 g.p.m. with drawdown of 10 feet.

Tarboro

Henderson Lumber Company
- Type of well - drilled
- Depth of well - 120 feet
- Diameter of well - 4.25 inches

Henderson Lumber Co. (cont'd)
Geologic formation - Cretaceous
Chief aquifer - sand
Yield - 8 g.p.m.
Remarks - screen

Henderson Lumber Co.
Type of well - drilled
Diameter of well - 6 inches
Geologic formation - Cretaceous
Chief aquifer - sand
Depth to water level - 21 feet
Yield - 60 g.p.m.
Remarks - About 9 feet of drawdown while pumping approximately 20 g.p.m. (See analysis under Well 66 in table on page 36 of Bulletin No. 51.)

Elite Laundry & Dry Cleaners
Type of wells - dug
Depth of wells - 35 feet
Diameter of wells - 36 inches
Geologic formation - Wicomico
Chief aquifer - sand
Depth to water level - 9.5 feet
Yield - 3 - 6 g.p.m.
Remarks - The two wells yield 3 to 6 g.p.m. depending on water-table level.

Mewbern Grist Mill
Type of wells - jetted
Depth of wells - 130 feet
Diameter of wells - 2 inches
Geologic formation - Cretaceous
Chief aquifer - sand
Depth to water level - 2 to 5 feet
Yield - 10 g.p.m. (approx.)
Remarks - The three wells flow 1 to 2 g.p.m. each and yield about 10 g.p.m. to a suction pump.

Tarboro Veneer Co.
Type of wells - bored
Depth of wells - 6 inches
Diameter of wells - 6 inches
Geologic formation - Wicomico
Chief aquifer - sand
Yield - 10 g.p.m. (approx.)
Remarks - The five wells, bored with hand auger, together furnish about 10 g.p.m.

Halifax County

Enfield

Woods Ice Plant

	Wells 1, 2, & 3	Well 4
Type of well	Jettied	Drilled
Depth of well	30 feet	596 feet
Diameter of well	2 inches	6 inches
Geologic formation	Sunderland	- -
Chief aquifer	Sand	Granite
Yield	15 g.p.m.	20 g.p.m.
Remarks	Three wells; yield 15 g.p.m. each	Cased 140 feet

Nash County

Taylor's Store
J.T. Taylor, Cotton Gin
Type of well - drilled
Depth of well - 60 feet
Diameter of well - 6 inches
Geologic formation - schist
Yield - 60 g.p.m.
Remarks - cased to bottom. Used for cooling oil engine at cotton gin. Pumping 15 g.p.m., with pitcher pump, lowered water level only 2.5 feet.

Battleboro
Battleboro Cotton Oil Co.
Type of well - drilled
Depth of well - 6 inches
Chief aquifer - Granite
Depth to water level - 20 feet (approx.)
Yield - 25 g.p.m.
Remarks - Cased 138 feet. Connected with town water system. (See analysis under Well 53 on page 57 of Bulletin No. 51.)

Rocky Mount
Carolina Power & Light Co.
Type of well - drilled
Depth of well - 97 feet
Diameter of well - 6 inches
Chief aquifer - Weathered granite
Depth to water level - 5 feet (approx.)
Yield - 8 g.p.m.
Remarks - Cased 73 feet. Water reported to be hard.
Texaco Station, C. G. Shearin
Type of well - dug
Depth of well - 30 feet
Diameter of well - 36 inches
Geologic formation - Sunderland
Chief aquifer - Sandy clay
Depth to water level - 9 inches

Nashville
Nashville Lumber Co.
Type of well - drilled
Depth of well - 100 feet
Diameter of well - 6 inches
Chief aquifer - Slate and schist
Depth to water level - 20 feet (approx.)
Yield - 5 g.p.m.
Nashville Grocery Co.
Type of well - drilled
Depth of well - 130 feet
Diameter of well - 6 inches
Chief aquifer - schist
Depth to water level - 15 feet (approx.)
Yield - 100 g.p.m.
Remarks - Cased 30 feet.

Momeyer

Bass Bros. Store

Type of well - drilled
Depth of well - 113 feet
Diameter of well - 6 inches
Chief aquifer - schist
Yield - 16 g.p.m.

Spring Hope

Brantley & Wood Co.

Type of well - drilled
Depth of well - 104 feet
Diameter of well - 4 inches
Chief aquifer - schist
Yield - 10 g.p.m.
Remarks - Cased 85 feet

Spring Hope Oil Mill

Type of well - drilled
Depth of well - 120 feet
Diameter of well - 4 inches
Chief aquifer - schist
Yield - 30 g.p.m.
Remarks - Cased 60 feet. Has always been adequate.

Webb Mill Company

Type of well - drilled
Depth of well - 66 feet
Diameter of well - 6 inches
Chief aquifer - slate and schist
Depth to water level - 20 feet (approx.)
Yield - 7 g.p.m.
Remarks - Cased 43 feet. Water contains very little iron.

B. F. Boone Service Station

Type of well - drilled
Depth of well - 73 feet
Diameter of well - 4.5 inches
Chief aquifer - schist
Depth to water level - 25 feet (approx.)
Yield - 5 to 6 g.p.m.
Remarks - Cased 14 feet. Water contains no iron.

Esso Service Station, J. H. Cox

Type of well - drilled
Depth of well - 115 feet
Diameter of well - 4 inches
Chief aquifer - schist
Depth to water level - 40 feet (approx.)
Yield - 1 to 2 g.p.m.
Remarks - Cased about 110 feet.

Sinclair Service Station

Type of well - dug
Depth of well - 41.5 feet
Diameter of well - 36 inches
Chief aquifer - clay
Depth to water level - 40 feet

Stanhope

Stanhope Ginning Co.

Type of well - drilled
Depth of well - 131 feet
Diameter of well - 4.5 inches
Chief aquifer - schist
Yield - 15 g.p.m.
Remarks - cased 63 feet.

CHAPTER V - USE OF WATER FOR RECREATION AND ELECTRIC POWER

Recreation - "North Carolina Almanac, 1954-1955", published by The Almanac Publishing Company, Raleigh, North Carolina, contains the following information regarding recreational facilities and use of water for recreation:

Beaufort County - There is a river resort at Bayview (on Pamlico River about 17 miles east of Washington), and a community beach and park at Belhaven on Pantego Creek near its confluence with Pungo River. Waters of the county are ideal for small boats. Bass, perch, crappie, bream, and striped bass abound in these waters. Pungo River and Painter, Grindle, and Tranters Creeks are recommended. The good hunting in the county includes waterfowl in addition to deer, bear, and quail.

Edgecombe County - Swimming, golf, and tennis are available at Tarboro, and parks, playgrounds, swimming, golf, and riding are enjoyed at Rocky Mount. Large-mouth bass, small-mouth bass, perch, shad, and rock are caught in Tar River and Swift, Deep, Fishing, and other creeks, and bream, robin, bass and jack are found in Nobles' Mill Pond.

Granville County - Bass and perch are found in Tar River and in some of the ponds in the county. Swimming is available at Oxford.

Halifax County - Shad, perch, and garfish may be caught in Fishing Creek.

Nash County - Swimming and fishing are available at the Rocky Mount Country Club. Silver Lake near Nashville is a recreational center which offers swimming, fishing, and boating. Large-mouth bass, perch, bream, robin, jackfish, rockfish, and shad are found in Tar River and its tributaries, and in Boddies Mill Pond (on Stony Creek about five miles northwest of Nashville), at which boating is available.

Pitt County - Bream, robin, striped bass, large-mouth bass, and small-mouth bass may be caught in Tranters Creek and Grindle Creek, and bream, robin, and bass are found in Chicod and Bear Creeks. Boats are available at the Chicod Creek bridge near Grimesland.

Electric Power - The following information is taken from House Document No. 187, 72d Congress, 1st Session:

Existing water-power plants - The largest water-power plant on the Tar River and its tributaries, and practically the only one of any size, is that of the Rocky Mount Mills at Rocky Mount, with a capacity of about 1,000 horsepower. The other plants are small water wheels which operate grist mills, sawmills, and cotton gins.

Natural power sites - Falls exist on the Tar River, Fishing Creek, and Swift Creek where these streams cross the "fall line". A mill was formerly operated on Fishing Creek at the point where this stream crosses the "fall line" near Enfield in Halifax County. This mill has been abandoned. There is a small gristmill at Goldrock, in Nash County, where Swift Creek crosses this line. At Laurel, in Franklin County on this same stream, there is a good site which is now developed by a gristmill. Other natural power sites are found on the smaller tributaries, but the flow of the streams at these sites is insufficient for developments of any size.

(The "fall line" is a zone, between the Piedmont Plateau and the Coastal Plain

which extends several miles east and west of a line through Weldon, Halifax, Enfield, Whitakers, Battleboro, Rocky Mount, Sharpsburg, Elm City, and Wilson. All of these municipalities are on the main line of the Atlantic Coast Line Railroad.)

Market for power - The population of the area, within a 50-mile radius of Rocky Mount, was 140,000 in 1920. The demand for electric power in this area is largely for domestic purposes. The capacity of existing plants is 30,300 kilowatts which is ample for present needs, and, should the demand increase, the power companies in the area can supply additional power. Based on the average annual increase in demand for electrical energy in the entire State of North Carolina since 1925, the annual increase for this area is estimated at 2,380,000 kilowatt-hours.

Cost of producing power by steam - From information obtained locally, it appears that the cost of producing continuous electrical-energy at the switchboards of the steam plants in this area varies from six mills to one cent per kilowatt-hour, depending upon the size, efficiency, and load factor of the plant, and that the market value of secondary power is from two to three mills. Based on these figures, the value of primary power, at the switchboards of the proposed hydroelectric plants considered in this report, has been taken as eight mills per kilowatt-hour and the value of secondary power at three mills per kilowatt-hour.

PROPOSED POWER DEVELOPMENTS

Development of power - On account of the small drainage areas of the streams, their variable flows, and the lack of natural power sites of any magnitude, it would not be feasible to develop a large quantity of power on the Tar River and its tributaries without storage. Consequently, during the reconnaissance a number of possible sites for storage reservoirs were investigated and the best ones studied in detail.

Sites selected - The sites selected for study are on the Tar River and Fishing Creek, its principal tributary. The other tributaries are too small to justify their development. The sites selected are as follows: No. 1 on Fishing Creek near Meltons Bridge (on the Halifax-Nash County line about 1.75 miles downstream from the confluence of Little Fishing Creek with Fishing Creek), No. 2 on Tar River immediately below Webbs Bridge (on U.S. Highway 64 about two miles southwest of Spring Hope in Nash County), No. 3 on Tar River at the mouth of Sapony Creek (about seven miles southeast of Nashville), and No. 4 on Tar River at Tarboro (about 0.3 mile upstream from U.S. Highway 64).

Site No. 1 is about 18 miles north and slightly west of Rocky Mount, and 10 miles west of Enfield. The main line of the Atlantic Coast Line Railroad crosses Fishing Creek eight miles below the site. A transmission line of the Virginia Electric and Power Company passes within six miles of the proposed dam. The drainage area of Fishing Creek at this point is 437 square miles.

At a short distance above Site No. 2, two important tributaries, Cypress Creek and Crooked Creek, join the Tar River. Another lesser tributary, Turkey Creek, also enters Tar River immediately above Webbs Bridge. The Atlantic Coast Line Railroad has a branch line which passes through the proposed reservoir a short distance above the dam site. The basin, drained by Tar River above this point, has an area of 668 square miles.

Site No. 3 is approximately four miles northwest of Sharpsburg and seven miles southwest of Rocky Mount. A transmission line of Carolina Power and Light

Company passes through Sharpsburg. The drainage area of Tar River above the proposed dam is 791 square miles.

Site No. 4 is 13 miles below the mouth of Swift Creek and six miles below the mouth of Fishing Creek. The Norfolk division and the Washington branch of the Atlantic Coast Line Railroad converge at Tarboro as well as North Carolina State highway nos. 90 and 12. (Presently, the highways converging at Tarboro are U.S. Highways 64 and 258 and N.C. Highways 44 and 122). Both the City of Tarboro and Virginia Electric and Power Company have power plants nearby. The drainage area of Tar River at the proposed dam site is 2,100 square miles.

Total head which would be developed by proposed projects - The total fall of the Tar River from the eastern Granville County line, where the drainage area is 257 square miles, to the mouth of the stream is 255 feet. The proposed power-developments, together with the existing plant at Rocky Mount, would develop 169 feet of the potential head or 66 percent of the total available in this reach. The total fall of Fishing Creek from the mouth of Shocco Creek, where the drainage area is 187 square miles, to its confluence with the Tar River is 118 feet. The proposed plant at Meltons Bridge (Site No. 1), the existing dam at Bellamys Mill site (at the confluence of Rocky Swamp and Fishing Creek about about five miles southwest of Enfield in Halifax County), and the proposed plant at Tarboro would develop 90 feet or 76 percent of this available head.

Power which would be developed by proposed plants - These four plants would be capable of developing power continuously at the rate of 6,484 kilowatts. This rate would produce annually, at the switchboards of the proposed plants, 56,799,800 kilowatt hours of electrical energy. In addition to this primary power, 14,156,344 kilowatt-hours of secondary power would be generated, by the proposed plants, during a normal year. In addition to the power generated at the proposed plants, the potential, average annual-output of primary power at the Rocky Mount Mills plant would be increased by 4,493,880 kilowatt-hours and that at Bellamy's Mill site by 1,103,760 kilowatt-hours.

Prospective annual revenue of plants - Using the values assumed above, the total value of the power produced annually by the system, during a normal year, would be $496,398. In addition, the system should receive credit for the additional primary power which the regulated flow would make available at Rocky Mount Mills and Bellamy's Mill. The value of this power has been taken as four mills per kilowatt-hour which would net to the system a total of $22,391 during a normal year. Thus, the total value of all power produced by the system would be $518,789.

Effect of proposed system on navigation - As previously mentioned, if these projects were installed, the minimum flow of the stream at Tarboro, the head of the proposed navigable channel (considered in House Document No. 187, 73rd Congress, 1st Session), would be increased from 87 second-feet to 1,134 second-feet due to their regulatory effect. This would make available at Tarboro an increased depth of three feet at extreme low stages and about two feet at ordinary stages for navigation purposes. However, as the governing depth of any navigation scheme on this stream should be at least 10 feet in order to be of economic value and as locks and dams are the only practical method by which this depth can be secured, the proposed power scheme would be of little value to navigation except to furnish additional water for lockages. There is already ample water for this purpose.

Value of proposed power system in increasing low-water flow - The increased minimum flow of the stream, caused by the regulating effect of these

power plants, would furnish industries with additional water for condensing, dyeing, and other purposes. Such a continuous flow woudl also increase the supply of water available for municipal use. However, no estimate of this increased flow is attempted, as there is now ample water for all existing cities and industries and enough to care for their growth for some years to come.

Effect of proposed power scheme on floods - If the four sites, considered in detail in this report, were all developed for power purposes, the reservoirs, created by the power dams, would reduce the number of minor floods but would have little effect on large floods such as those of 1919 and 1928.

Cost of works - The total cost of developing the four sites, mentioned above for power, is estimated at $10,738,980 or $796 per kilowatt of installed capacity.

Stream Flow Records - Mean monthly, maximum daily, minimum daily, and mean weekly discharges at four stream-gaging stations and miscellaneous measurements of discharges, in the Tar River Basin, may be found in "Hydrologic Data on the Roanoke and Tar River Basins, 1871-1945", published in 1952 by the North Carolina Department of Conservation and Development and prepared in cooperation with the United States Geological Survey. Stream-flow data for years subsequent to 1945, at the gaging stations indicated above, are shown hereinafter in this chapter. The monthly discharges are yearly means. There are also shown stream-flow data at two gaging stations, Herring Run near Washington and Sapony Creek near Nashville, which were established in January 1950 and April 1950, respectively. No data is shown for two gaging stations, Cedar Creek near Louisburg and Conetoe Creek near Bethel, which were established in September 1956 and December 1956, respectively.

Fishing Creek near Enfield, Halifax County

Location - Water-stage recorder, at bridge on U. S. Highway 301, 2000 feet downstream from Atlantic Coast Line Railroad bridge, 2 miles southwest of Enfield, and 4.75 miles downstream from Rocky Creek. Datum of gage is 76.25 feet above mean sea level, datum of 1929, supplementary adjustment of 1936.

Drainage area - 521 square miles.

Records available - October 1918 to date.

October 1918 to December 1945

Average discharge - 334 m.g.d.
Extremes - Maximum discharge, 13,100 m.g.d. July 25, 1919; maximum gage height, 19.6 feet July 24, 1919; minimum discharge, about 6.5 m.g.d. Oct. 19, 1933; maximum stage known, 21.0 feet April 19, 1910.

Remarks - Records fair. Discharge for days of considerable change of stage computed by using rate of change of stage as a factor. Slight diurnal fluctuation and some regulation at low flow caused by mills above station.

	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956
Mean monthly discharge, m.g.d.	359	298	438	374	205	156	359	298	302	243	315
Mean monthly discharge, c.f.s.	555	462	678	579	317	241	556	462	468	376	487
Maximum mean weekly discharge, m.g.d.	1410	1240	2470	1630	541	724	1690	1250	2960	1050	1540
Maximum mean weekly discharge, c.f.s.	2120	1920	3830	2530	838	1120	2620	1940	4580	1620	2380
Minimum mean weekly discharge, m.g.d.	57	92	48	95	52	26	46	21	9.7	45	36
Minimum mean weekly discharge, c.f.s.	89	142	74	147	81	41	71	32	15	29	55
Maximum daily discharge, m.g.d.	2430	2060	3630	2870	1120	1290	3260	2060	4100	2420	3040
Maximum daily discharge, c.f.s.	3760	3190	5620	4450	1740	1990	5050	3190	6340	2740	4710
Minimum daily discharge, m.g.d.	50	63	42	75	45	26	38	16	6.5	23	30
Minimum daily discharge, c.f.s.	78	97	65	116	69	40	59	25	10	35	46

Herring Run near Washington, Beaufort County

	1950	1951	1952	1953	1954	1955	1956
Mean monthly discharge, m.g.d.	5.23	2.13	2.53	4.11	3,97	9.0	5.8
Mean monthly discharge, c.f.s.	8.10	3.29	3.92	6.36	6.14	14.0	9.24
Maximum mean weekly discharge, m.g.d.	77	14	20	16	26	86	26
Maximum mean weekly discharge, c.f.s.	119	21	31	24	40	133	40
Minimum mean weekly discharge, m.g.d.	0.52	0.50	0.517	0.517	0.452	0.517	.618
Minimum mean weekly discharge, c.f.s.	0.800	0.770	0.800	0.800	0.700	0.800	.957
Maximum daily discharge, m.g.d.	96	36	54	37	52	253	51
Maximum daily discharge, c.f.s.	148	55	84	58	80	391	79
Minimum daily discharge, m.g.d.	0.452	0.452	0.517	0.517	0.452	0.452	0.581
Minimum daily discharge, c.f.s.	0.7	0.7	0.8	0.8	0.7	0.7	0.9

Sapony Creek near Nashville, Nash County

	1951	1952	1953	1954	1955	1956
Mean monthly discharge, m.g.d.	17.2	39.8	37.1	41.8	46.0	39
Mean monthly discharge, c.f.s.	26.6	61.6	57.5	64.7	71.2	60
Maximum mean weekly discharge, m.g.d.	96	302	181	589	410	192
Maximum mean weekly discharge, c.f.s.	148	467	280	911	634	297
Minimum mean weekly discharge, m.g.d.	.366	.304	.037	.017	2.97	.575
Minimum mean weekly discharge, c.f.s.	.566	.471	.057	.026	4.59	.890
Maximum monthly discharge, m.g.d.	190	724	524	1160	982	576
Maximum monthly discharge, c.f.s.	294	1120	811	1800	1520	892
Minimum monthly discharge, m.g.d.	.065	.129	.026	.013	1.10	.258
Minimum monthly discharge, c.f.s.	.100	.200	.040	.020	1.70	.4

Tar River near Nashville, Nash County

Location - Water-stage recorder at Cockrell Bridge on Nashville-Wilson road (N.C. Highway 58), 5 miles upstream from Sapony Creek and 10 miles south of Nashville. Datum of gage is 110.96 feet above mean sea level, datum of 1929, supplementary adjustment of 1936.

Drainage area - 701 square miles.

Records available - October 1928 to date.

October 1928 to December 1945

Average discharge - 503 m.g.d.

Extremes - maximum discharge, 10,900 m.g.d. Dec. 3, 1954 (gage height - 20.8 feet); minimum discharge observed, 6.5 m.g.d., Sept. 20, 1932 (gage height - 1.50 feet).

Remarks - Records good except for those of no gage-height record, which are poor. Considerable diurnal fluctuation and some regulation at low flow caused by power plants above station.

	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956
Mean monthly discharge, m.g.d.	455	417	643	475	319	260	537	484	453	440	284
Mean monthly discharge, c.f.s.	705	646	996	736	494	402	831	749	701	681	642
Maximum mean weekly discharge, m.g.d.	2300	1800	3620	1600	827	1260	3000	1990	4140	3310	1630
Maximum mean weekly discharge, c.f.s.	3560	2780	5600	2480	1280	1950	4640	3080	6410	5120	2530
Minimum mean weekly discharge, m.g.d.	74	97	71	129	90	36	56	23	14	61	50
Minimum mean weekly discharge, c.f.s.	115	150	110	199	140	56	87	35	21	94	77
Maximum daily discharge, m.g.d.	3740	2480	5430	3220	1540	2240	4590	3620	5490	6650	3680
Maximum daily discharge, c.f.s.	5790	3840	8410	4980	2390	3470	7100	5600	8500	10300	5690
Minimum daily discharge, m.g.d.	96	91	89	134	113	22	72	17	15	40	34
Minimum daily discharge, c.f.s.	62	59	57	87	73	14	47	11	23	62	52

Tar River at Tarboro, Edgecombe County

Location - Water-stage recorder at highway bridge (N.C. 44 and U.S. 64 and 258) at Tarboro, and 6.5 miles downstream from Fishing Creek. Datum of gage is 10.37 feet above mean sea level, datum of 1927, supplementary adjustment of 1936.

Drainage area - 2,140 square miles.

Records available - August 1896 to December 1900, October 1931 to date.

1896-1900 and 1931-1945

Average discharge - 20 years, 1494 m.g.d.

Extremes - Maximum discharge, 24,000 m.g.d. Aug. 20, 1940 (gage height - 31.77 feet; minimum discharge, 23 m.g.d. Oct. 17 and 22, 1933 (gage height - 0.45 foot). Maximum stage known, 34.2 feet, present datum. July 27, 1919 (discharge, 34,100 m.g.d., from rating curve extended above 24,500 m.g.d.).

Remarks - Records good except those based on once-daily gage readings, which are fair. Discharge, for days of considerable change in stage, computed using rate of change of stage as a factor. Some diurnal fluctuation at low flow caused by power plants above station.

Tar River at Tarboro(cont'd.)

	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956
Mean monthly discharge, m.g.d.	1537	1247	1985	1501	874	666	1585	1298	1284	1370	1390
Mean monthly discharge, c.f.s.	2380	1930	3073	2324	1353	1031	2453	2010	2143	2120	2150
Maximum mean weekly discharge, m.g.d.	6980	4630	8850	4630	2030	3050	10100	4750	12400	8850	6520
Maximum mean weekly discharge, c.f.s.	10800	7170	13700	7170	3140	4720	15600	7360	18300	13700	10100
Minimum mean weekly discharge, m.g.d.	187	311	165	327	289	92	169	99	41	240	165
Minimum mean weekly discharge, c.f.s.	290	482	255	506	448	143	262	153	64	385	255
Maximum daily discharge, m.g.d.	8270	5510	1250	6590	3060	3950	11300	6240	15000	10600	8270
Maximum daily discharge, c.f.s.	12800	8530	1940	10200	4240	6110	17500	9660	23300	16400	12800
Minimum daily discharge, m.g.d.	165	192	122	255	236	70	132	74	32	152	148
Minimum daily discharge, c.f.s.	256	297	189	394	366	108	204	115	49	236	229

Tar River near Tar River, Granville County

Location - Water-stage recorder and concrete control at bridge on State Highway 96, 1.25 miles upstream from Fishing Creek, 2.5 miles east of Town of Tar River, and 8 miles south of Oxford.

Drainage area - 161 square miles.

Records available - November 1939 to date.

Extremes - November 1939 to December 1945

Maximum discharge, 6850 m.g.d. Sept. 18, 1945 (gage height, 16.51 feet); minimum discharge, 1.29 m.g.d. Nov. 9 and 22, 1941.

Remarks - Records good except those for period of no gage-height record, which are poor. City of Oxford diverts about 0.323 m.g.d. for water supply.

	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956
Mean monthly discharge, m.g.d.	83.3	95.0	159	93.0	70.4	56.4	143	106	87.2	101	65
Mean monthly discharge, c.f.s.	129	147	246	144	109	87.3	222	164	135	156	118
Maximum mean weekly discharge, m.g.d.	536	524	1100	522	451	375	795	724	711	1460	557
Maximum mean weekly discharge, c.f.s.	830	811	1700	808	698	581	1230	1120	1100	2260	863
Minimum mean weekly discharge, m.g.d.	1.72	5.0	2.98	5.1	6.4	0.38	4.78	.258	.094	2.87	.381
Minimum mean weekly discharge, c.f.s.	2.66	7.8	4.61	7.9	9.9	0.59	7.4	.400	.146	4.44	.59
Maximum daily discharge, m.g.d.	2080	2720	2920	1330	1560	1350	3910	2580	2160	6780	2100
Maximum daily discharge, c.f.s.	3220	4210	4520	2060	2420	2090	6050	4000	3340	10500	3260
Minimum daily discharge, m.g.d.	1.42	2.13	2.26	3.68	3.15	0.26	4.07	.129	0.06	2.20	.194
Minimum daily discharge, c.f.s.	2.2	3.3	3.5	5.7	4.9	0.4	6.3	0.2	0.10	3.4	.3

CHAPTER VII - GROUND WATER

The following information is taken from "Bulletin Number 51, Ground Water in the Halifax Area, North Carolina, by M. J. Mundorff", published by the North Carolina Department of Conservation and Development in 1946 and prepared in cooperation with the Geological Survey, U. S. Department of the Interior.

Physiography - In Granville, Franklin, Vance and Warren Counties and the western parts of Halifax and Nash Counties, the topography is typical of the Piedmont province. Crystalline rocks are at the surface or are covered only by discontinuous patches of unclassified high-level sand and gravel and remnants of the Brandywine and Coharie terrace-deposits. The land-surface elevations are 150 to 200 feet near the larger streams where the surface has been eroded to approximate maturity. The interstream areas have much-lower land-surface elevations and, in places, are poorly drained. The comparatively-flat areas west of, and higher than, the western Pleistocene terrace were formed by erosion and are what is left of the extensive pre-Pleistocene land surface worn down by erosion. Along the western margin of the western parts of Halifax and Nash Counties, the upland is 300 to 400 feet above sea level. In the Piedmont province, the eastward slope of the surface is 12 to 15 feet per mile and, in the Coastal Plain province, the slope flattens out to about two or three feet per mile. The eastern edge of the western parts of Halifax and Nash Counties is only about 60 to 90 feet above sea level.

The Coastal Plain province, including the eastern parts of Halifax and Nash Counties and the Counties of Edgecombe, Pitt, and Beaufort, is underlain by a wedge of Tertiary and Cretaceous sediments which are 1,000 to 2,000 feet thick along the coast and become thinner westward until they disappear along the Fall Zone. These formations are, however, rarely exposed at the surface as they are covered nearly everywhere by the Pleistocene terrace-deposits. These terraces are the outstanding physiographic-features of the Coastal Plain province, forming irregular belts extending northeast-southwest across the eastern part of the State. The highest terrace is believed to be the oldest, and the lower terraces are successively younger. The terraces were formed at the margin of the sea when it stood at different levels in Pleistocene time. They slope gently eastward and were formed during comparatively-long halts in the fluctuation of the sea level. Each terrace is generally separated from the next higher one by a more or less pronounced scarp which marks the shore of the sea line that formed it . . . .

Source of Ground Water - The principal source of ground water in this area (Edgecombe, Nash, and Halifax Counties) is from precipitation as rain or snow. The only other water that needs consideration in this report is that which was trapped in the sedimentary rocks at the time of their deposition or entered them during the later inundations by the sea.

The average yearly-precipitation is about 45½ inches. Stream-flow carries off about one-third thereof, another one-third is lost by evaporation and by transpiration through vegetation before reaching the water table, and the remaining one-third reaches the water table, so that recharge to ground water from precipitation is roughly about 15 inches a year. Although the ground-water level (known as the water table) fluctuates considerably, the amount of water held in storage changes very little when considered over a period of years, so that average annual-recharge to the ground water is approximately equaled by the average annual-discharge of ground water. Discharge occurs through springs, seeps, and wells, and by evaporation and transpiration. Most of the water, discharged by the springs and seeps, enters the streams and maintains their flow during

periods of no rainfall.

Some sea water was trapped in the sediments when they were deposited or entered the rocks at times when the sea stood at high levels. After the sea receded from the land, this water began to drain out and to be diluted with fresh water from precipitation. In some areas, the sea water has been entirely replaced by fresh water. In other areas, the flushing and dilution have been less complete, and some of the original, or induced, sea water remains. Sea water, in the sediments at the time they were deposited, is called connate water, and sea water, introduced at some later time when the land was again submerged, may be termed "intrudent" water. It is probable that, if any connate or intrudent water is present within the area indicated above, it is very dilute and occurs only locally. However, in Pitt and Beaufort Counties at depths of 100 to 500 feet, connate or intrudent water is common, and the chloride content may be as high as 10,000 parts per million which is about one-half as salty as sea water. . .

Occurence of Ground Water - The porosity of a rock is the percentage of the total volume that is occupied by the openings or interstices in the rocks. When all of the interstices are filled with water, the rock is thoroughly saturated with moisture. Natural-rock materials differ greatly in porosity. The porosity of igneous rocks, such as granite, may not be more than one percent, while the porosity of some clays may be as much as 50 percent. The porosity of clean sands and gravels may be 30 or 40 percent. When sands and clays are cemented and compacted to form sandstones and shales, the porosity is greatly decreased.

The interstices, in the igneous rocks and metamorphic rocks (such as slate, schist, and granite-gneiss), are secondary and consist of joints, fractures, faults, cleavage planes, etc. Since many of these interstices are formed by weathering processes near the earth's surface, they decrease in size and number with depth. The soil itself may have a porosity of 50 percent. As the subsoil, and then the partially decomposed and disintegrated bedrock, are reached, the porosity decreases, and the solid bedrock may have a low porosity.

A rock or soil may have a large porosity and yet yield little water, even though allowed to drain for a long time. A clay, for example, with a porosity of 50 percent might not yield any water because of the smallness of the pores, the water being retained because of molecular attraction. Some water also may be retained in a rock because the pores are isolated or poorly-interconnected. The ratio of the volume of water, which a saturated rock will yield by gravity, to the total volume of rock is the specific yield and is stated as a percentage.

While porosity and specific yield are important in an aquifer(water-bearing rock), the most important characteristic of the aquifer is its ability to transmit and to yield water readily. This characteristic has little relation to the porosity. A clay, for example, may have a 50-percent porosity and not yield any appreciable amount of water, while a sand or gravel with only 30-percent porosity may yield large quantities in a short time. This ability of an aquifer to transmit and yield water is called its permeability. The reason that clays are impermeable is that the pores are so small that the water is held in place by molecular attraction. In silt and extremely fine sand, the pores are larger and the molecular attraction is less but may still be so great that water is transmitted only very slowly. A small amount of clay or fine sand, mixed in a medium or coarse sand, will greatly decrease the permeability.

Ground water flows because of gravity and, therefore, the intake or recharge area is at a higher elevation than the area of discharge. The velocity of ground water varies directly as the hydraulic gradient. In a humid region, such as eastern North Carolina, the ground water discharges to the perennial

streams and lakes, and the lowest points on the water table are at these places. Rain, falling on an area, seeps downward to the water table and then moves toward the point of discharge in some stream valley, lake, or swamp. During the winter and spring, when the water level is high, the head is greater, the movement will be faster, and the ground-water discharge will be greater than in the autumn when the gradient may be very low.

Ground water in different types of rocks - The ground water in sand and gravel occurs in the openings between the grains and moves by flowing through these interconnected pores. Water in clay occurs similarly but movement is practically negligible, and little water can be recovered from such material. Sandstone is formed by cementation of the sand grains, the cement filling in between the grains so that the porosity is greatly reduced and, in a sandstone cemented by silica, may be very small. Clay becomes shale by compaction or cementation or both, and porosity is very much less than in the unconsolidated sediments. The permeability of consolidated rocks, through the primary interstices, is usually very low. However, geologic forces, acting on such a consolidated rock, produce secondary interstices such as joints, fractures, faults, etc., along which water can move.

Limestone usually has little primary-porosity, but secondary openings, such as joints, fractures, and solution cavities, are important avenues of ground-water movement. Enormous quantities of water may be transmitted through cavernous limestone and very large quantities through limestone with small solution-channels.

In unweathered igneous and metamorphic rocks, the water is contained and can move only in joints, fractures, faults, cleavage planes, and similar openings. When such fractures are pressed tightly together, little water can be held and movement is very slow. Because of the great weight of the overlying rock, fractures will not remain open at depths greater than a few thousand feet, and the size and number of such openings decrease rapidly in the first few hundred feet below the surface. This type of rock is usually weathered to a depth of 20 to 100 feet in eastern North Carolina and, near the base of the weathered zone, the rocks are greatly fractured and broken but have not decomposed so greatly as to seal up the openings with clay; therefore, the zone just above the unweathered, solid rock frequently has greater porosity and permeability than any other zone.

If the water can rise and fall freely with changes of hydrostatic head and rain water can percolate downward directly to the zone of saturation in the aquifer, the water is termed phreatic water. The surface of the zone of saturation is called the water table, and the water in a well will stand at that level. In a humid region, the water table is an undulating surface reflecting, in a modified way, the undulations of the topography. The undulations in the water table are less abrupt than the undulations in the topography, and the water table may be nearer the surface at the center of wide, flat uplands than it is near the edge if ground water is discharged in the adjoining lowland. The depth to the water table is dependent largely upon climate, topography, and geology. Since the climate is nearly uniform throughout this area, the depth to the water table depends largely upon topography and the character of the rocks. In the more rugged areas of Granville, Franklin, Vance, and Warren Counties and the western parts of Halifax and Nash Counties, the water table may be 50 or more feet below the surface while, in the eastern parts of Halifax and Nash Counties and in the counties of Edgecombe, Pitt, and Beaufort, the water level will be only a few feet below the surface. . . .

Fluctuations of the water table - The ground-water level, or water table, will fluctuate with rainfall. A number of other factors, however, com-

plicate the correlation of rainfall to ground-water level.

Several inches of rain, falling in a very short time, will not raise the water level as much as the same amount of rainfall over a longer period, all other things being equal, because the capacity of the soil to transmit the water to the water table is limited. For example, if the soil has the ability to transmit water at a rate equal to 2 inches a day and 4 inches fall in one day, then only half of the water can reach the water table but, if 2 inches fall each day for 2 days, then all of the water can reach the water table. On the other hand, if the soil is dry and the rain falls in showers, a fraction of an inch at a time, then all the water may evaporate from the soil between showers so that 4 inches of rain, falling in a number of showers, will not raise the water table as much as the same amount falling in a slow, steady rain. Then again, soil, which is composed of varying proportions of sand, silt, and clay, will hold a considerable amount of water by the molecular attractions of the particles, and this water is not available for the ground water. After a long, dry period, this water, called the soil moisture, is depleted by evaporation and transpiration, perhaps for many feet below the surface. Before any water can reach the water table, this soil-moisture deficiency must be made up.

During the summer months, the evaporative capacity of the air is several times as great as during the winter months. Transpiration losses through vegetation may have an even greater effect. During the winter months, plant life is dormant so that little water is lost by transpiration, the evaporative capacity is low, little water is lost through such capacity, and rain is apt to fall slowly and steadily. During the summer, transpiration losses and evaporative losses are very high, and the rain is apt to come in short, heavy showers which result in high surface-runoff. For these reasons, the ground-water level recedes during the summer and autumn months, although these months have the heaviest rainfall. During the winter months, a little rainfall will raise the water level. because a large part of the water reaches the water table. . . .

Artesian water - In the Coastal Plain, the rocks consist of alternating sand-layers and clay-layers that dip eastward. A permeable sand-stratum, lying close to or at the surface, will receive water from rainfall. As the water percolates down the dip through the saturated stratum, it is prevented from escaping upward by the presence of overlying, impermeable strata. If a well is drilled through the impermeable strata, the water will rise above the saturated aquifer, and the well is an artesian well. The surface, determined by the heights to which the water will rise in a considerable number of wells penetrating the aquifer, is called the piezometric surface. The height of this surface depends upon the the height of the water table in the area of recharge and the permeability and rate of discharge of the aquifer. The surface nearly always slopes down the dip away from the recharge area and, in the North Carolina Coastal Plain, this slope is generally to the southeast. The land surface also slopes in that direction and, in some places, at a greater rate than the piezometric surface. Where the land surface is below the peizometric surface, wells will overflow at the land surface.

Utilization of ground water - Water is usually obtained from the water-bearing formations through wells, springs, or infiltration galleries. The different types of wells include dug, bored, driven, and drilled wells.

Dug wells in this area usually are less than 70 feet deep and are large enough for a man to enter. Dug wells have a large storage-capacity, which is an advantage if the permeability of the water-bearing formation is very small. If, for example, the permeability is such that only one gallon a minute will flow into

the well, a small-diameter well would have to be pumped 100 minutes to furnish 100 gallons of water. One hundred gallons can be removed from a dug well in a few minutes, the water level will be lowered a few feet, and the well will gradually fill back up to the original level. Although the small-diameter well might furnish as much water in a day, it would be necessary to pump it continuously.

One disadvantage of dug wells is that many cannot be dug much below the water table, and they may go dry in periods of drought. Furthermore, in some areas of crystalline rocks, the water table falls below the weathered portion of the rock during dry periods, so that the well goes dry and it is impossible to dig deeper because of the hardness of the rock. Another very important disadvantage of the dug well is the danger of pollution. These wells usually are shallow and, if cased, the casing is seldom tightly-fitted. When water is withdrawn from a well, a cone of depression is created in the water table so that water flows toward the well from every direction. The extent of the cone of depression depends on the amount of water withdrawn and the extent, thickness, and permeability of the material. However, it usually extends not less than several hundred feet. If any source of harmful bacteria is within this area, it is quite probable that water containing such bacteria will reach the well. If the well is down-slope from such a source of pollution, it is quite possible that the well will be contaminated even though the source is beyond the limit of the cone, because the natural ground-water gradient is usually down-slope until it comes within the influence of the cone of depression. Dug wells have the additional disadvantage in that surface water may flow directly into the well, either at the top of the ground or through loose joints or openings in the curbing, and this surface water is frequently polluted. Furthermore, many dug wells are open, and foreign material may fall directly into the well. Frequently, a part of the water, being withdrawn from such a well, will run back into the well carrying pollution from, or near, the top of the well.

If it proves necessary to use this type of well, certain precautions will reduce the possibility of pollution. The wall should be several hundred feet from any possible source of pollution and preferably up-gradient from such source. It certainly should not be down-gradient. The well should be cased tightly, and the curb at the top should be tight and covered. The surface should be graded up around the well so that surface water will drain away. The water should be tested periodically for contamination, preferably by the State Board of Health.

Driven wells usually consist of several lengths of 1¼-inch pipe at the bottom of which is a well strainer and pump. This apparatus is driven into the ground to the required depth, usually from 10 to 50 feet, and a suction pump is used to pump the water. Use of the small-diameter driven well is practically limited to sand of least moderate permeability, for the water must flow to the well at about the rate of withdrawal because there is little or no storage within the well. Although many domestic supplies are obtained from driven wells, these water supplies are subject to many of the same possibilities of pollution as the dug wells, and the same precautions should be observed.

Bored wells are constructed with some type of earth auger, either hand operated or power driven, and are practically restricted to clay, sandy clay, and clayey sand. The wells, which are bored by hand, usually cannot be constructed in clean sand because the sand caves into the well. The larger sizes, 12 to 24 inches, are usually cased with tile and are similar to dug wells. One advantage of bored wells is that they often can be bored farther below the water table so that there is less danger that they will go dry in periods of drought. However,

if a boulder or loose or solid rock is encountered in a dug well, it can often be removed, while encountering such material in a bored well will necessitate abandonment of the hole. The smaller-diameter bored wells sometimes are cased with tile and sometimes are left uncased. Usually a $1\frac{1}{4}$-inch pipe and a pitcher pump are used to withdraw the water. Occasionally, these wells are unsatisfactory in sand because, if cased, the casing shuts off the water and, if left open, the walls soon cave in, shutting off the supply. If the hole will stay open for a short time, small gravel can be placed in the hole around a $1\frac{1}{4}$-inch pipe and strainer making, in effect, a gravel-packed well. The gravel should not fill the hole to the surface, but the last few feet should be filled with tamped clay to prevent surface water from running down from the top. These wells are subject to pollution to about the same degree as dug and driven wells.

Drilled wells are usually constructed by machine, but some are constructed by hand. The most common method of drilling wells, in Nash, Halifax, and Edgecombe Counties, is the use of a cable-tool machine which lifts a heavy drill and then allows it to drop, breaking the rock or other material. This type of construction is especially adapted to hard rock and deep wells in any kind of rock.

Jetting, or "washing down", wells is another method of drilling wells, used only in unconsolidated or soft, weathered rocks. In this method, a hollow pipe, with a bit on the end, is used for a drill and is alternately raised and dropped. The bit has one or two holes so that water can be forced down through the hollow stem, out the holes, and up to the surface inside the casing around the drill. Sometimes, especially in small-diameter wells, the casing itself is used as the drill. The bottom end of the casing is left open; water is forced down through it and returns to the surface around the outside of the casing. The jetting method is used in the unconsolidated formations in the Coastal Plain and in the soft, deeply-weathered slates.

The rotary-drilling method involves use of a cutting bit at the end of a hollow-drill stem. The bit is rotated, and water is forced down the stem. The water returns to the surface in the casing and brings the cuttings up with it. Drilled wells of this type are usually restricted to unconsolidated, or the softer consolidated, rocks. Such wells are usually of large diameter. Wells, 48 inches or more in diameter, can be drilled to considerable depths by this method, and it is suitable for construction of gravel-packed or gravel-walled wells. The gravel-packed or gravel-walled wells are particularly useful in fine and medium-fine grained sands. . .

Domestic and other supplies in Nash, Edgecombe, and Halifax Counties - Most domestic supplies within the area are from dug, bored, driven, or drilled wells. Most of the water is soft enough for all domestic uses, but sometimes an objectionable amount of iron is present. Also, some of the water contains excessive carbon dioxide enabling the water to corrode the pipes with which it comes in contact, dissolving the iron. Excessive iron is not known to be biologically harmful but is not particularly pleasant to the taste. The principal objection to excessive iron is the staining of enamelled ware and laundry. . .

Many of the municipal supplies from wells are of satisfactory quality, both chemically and bacteriologically, and are not treated. Most public and semi-public places, such as schools, hospitals, county homes, and other institutions that do not have a municipal water-supply, use drilled wells. Most of these supplies are satisfactory, but a few, in areas of crystalline rocks, are insufficient in quantity. Usually, the water is not treated but, occasionally, it has been necessary to make some provision for removal of iron.

A large number of industries utilize ground-water supplies, although none use large amounts of water. The uses include processing as in paper and cotton mills, cleaning as in laundries and dry cleaners, cooling boiler-feed water, and the manufacture of ice and soft drinks. The temperature of the ground water in this area ranges from 59 to 63 degrees, averaging about 62 degrees Fahrenheit. The water is usually soft, so that little trouble is experienced from boiler scale. Supplies of several million gallons of water a day could be obtained from the Cretaceous deposits. . . .

Rock Formations and their Water-bearing Properties

Pre-Cambrian gneisses and schists - The water-bearing properties of the more schistose rocks are similar to those of the slate and schist series, and the properties of the granite gneisses are similar to those of the granites. The more finely-schistose strata will probably furnish the most water, whereas the massive, unjointed gneisses will furnish only small amounts. The water from the schist is soft but, in many places, contains objectionable amounts of iron. In contrast, the water from the gneiss is harder and usually free from iron . . .

Pre-Cambrian (?) Slates and Schists - This series is one of the best of crystalline rocks for the development of ground-water supplies, especially where quartz veins are plentiful. Deformation of the rocks, since the formation of the veins, has broken and fractured the quartz and caused a certain amount of rotation of the angular fragments, so that small interconnected-cavities were left throughout the veins. It is possible that circulating ground-waters have removed some of the surrounding-country rock by solution. At any rate, these veins now serve as passageways for the circulation of ground water, and concentrations of quartz veins indicate places favorable for drilling. Many drillers know this and search for exposures of "flint rock" when locating a well.

The metamorphic rocks (slates, schists, and granite-gneiss) usually are weathered very deeply, often 75 to 100 feet, and, therefore, drilling is comparatively easy. Drilling is not difficult in the unweathered rock, except in the more-intensely metamorphosed granite. Because of the deep weathering of the schists, jetting or "washing down" of small-diameter wells is practicable, and this type of well is common. Wells, up to 160 feet deep, have been drilled by hand in this way, and many of the jetted wells range from 90 to 100 feet in depth. A 1¼-inch casing is nearly always used which, for several reasons, seems to be generally undesirable. In the first place, if a hard layer is struck before obtaining a sufficient supply of water, the small diameter of the casing prevents use of a drill heavy enough to break through, and the hole must then be abandoned. By using a larger casing, 2 to 3 inches in diameter, a heavier drill can be used and the hard layer broken through. It frequently happens that a good supply of water is found just beneath the hard layer which was serving as a barrier to upward circulation. In the second place, a deep-well pump cannot be used on a 1¼-inch casing and, therefore, the water level of these wells can only be lowered to 25 or 30 feet below the surface, which is the limit of lift of a vacuum pump. If the diameter of the casing is 2 inches or more, a deep-well pump can be used, and the water level may be lowered almost to the bottom of the well. During the present investigation, a number of 1¼-inch wells were found that had never been used because the depth to the water was greater than the limit of the lift of a vacuum pump. Others had been satisfactory previously but, because of the long, dry period, the water level had receded beyond the limit of lift of the vacuum pump. Besides the wells that furnished no water at all for these reasons, many others yielded insufficient supplies because the static water-level was so low. Some wells have been made effective by digging a hole around the casing so that a well cylinder can be placed closer to the

water surface. However, this usually costs many times the additional amount necessary to use a 2 or $2\frac{1}{2}$-inch casing instead of a $1\frac{1}{4}$-inch casing when drilling the well.

Dug wells in the slate and schist have usually obtained satisfactory supplies of water. Because of the softness of the rock and the deep weathering, it is nearly always possible to dig the wells deep enough to assure that it will not go dry during long periods of drought. If it is necessary to use such a well, the precautions, outlined in the fourth paragraph hereinbefore in this chapter under "Utilization of ground water", should be closely observed. . . .

Carboniferous (?) Granites - The granite belts are generally not very favorable for development of even moderate supplies of ground water and, in many places, are distinctly unfavorable for the development of even small domestic-supplies. Granite is impervious except where secondary interstices have been formed, and all movement of ground water is along joints, fractures, and like channels. In many places, the granite is massive and relatively free from joints or fractures and, after entering solid rock, a well in granite may be drilled for hundreds of feet without intersecting a fracture. Even if a fracture or joint is encountered, the amount of water, moving along the minute opening, may be very small. . . .

Dug wells in granite usually furnish satisfactory amounts of water for small domestic-supplies. In some areas, however, the granite is so resistant to weathering that hard, fresh rock is close to the surface, and it is difficult to dig wells deep enough to obtain a satisfactory supply of water. In some areas, the water level drops below the weathered zone during long, dry periods, and most of the wells go dry. . . .

Small springs, mostly of the contact type, are usually plentiful in granite areas. Precipitation seeps downward through the weathered and broken mantle-rock on the hills, then moves laterally on the surface of the ground. When it is necessary to use water from dug wells and springs, every precaution should be taken to prevent pollution of the water, and bacterial analyses should be made frequently to check its purity. . . .

Cretaceous Deposits - These geological formations (underlying the deposits of the Brandywine, Coharie, Sunderland, and Wicomico terraces in Nash and Edgecombe Counties and including clay, sand, sandy-clay, and gravel) comprise the most important source of industrial and municipal water-supplies and of domestic supplies using drilled wells. Along the western margin of the formations, and for several miles eastward, it is not very thick. The clays are so impermeable as to furnish no water at all, and many of the sand layers also contain considerable clay and, therefore, are practically impermeable. However, occasional lenses of cleaner sands may be found that will furnish considerable quantities of water. . . .

Where the thickness of Cretaceous Strata is 150 to 200 feet or more, moderate to large supplies can usually be developed. . . In many domestic-wells ending in the strata, the casing extends down until the water-bearing sand is reached, and drilling is stopped at that point. Therefore, all the water must enter the well through a small area of sand equal to the cross-sectional area of the casing. Many domestic wells, $1\frac{1}{4}$ to 6 inches in diameter, in these strata have yielded 10 to 50 gallons a minute in this way, and it is obvious that the yield would be many times as great if a properly-selected screen were used.

The water area in all wells, definitely known to end in the Cretaceous strata, is under artesian pressure and will rise above the aquifer. In some

areas, where the land surface is low, the water will rise to the surface and flow from the well. . . .

Little precipitation falls directly on the cretaceous sediments because of the limited extent of its exposures. Recharge to them occurs principally by downward percolation of rain water through the overlying formations.

Yorktown Formation - The deposits of this formation consist mostly of blue arenaceous-clay and argillaceous-sand, and only a relatively-few wells obtain their water from them. In the first place, the strata generally contain so much clay that the permeability is low and only small supplies can be obtained. Secondly, the water is generally hard and frequently contains some suspended matter which gives the water a bluish cast and often a peculiar odor and taste. At some places, however, lenticular layers of clean sand have been found which furnish moderate supplies of water. The Miocene deposits (Yorktown formation) should not be overlooked as a source of water, particularly along the Fall Zone where the Cretaceous sediments are thin or absent. This zone, through Enfield, Whitakers, Battleboro, Rocky Mount, Sharpsburg, and Elm City, has proven to be a very difficult one in which to obtain satisfactory water-supplies. Usually, the crystalline rocks are covered so deeply that drilling into them is a gamble with the odds greatly against obtaining more than a few gallons a minute. Properly-constructed, screened, or gravel-packed wells in the Miocene strata may furnish moderate supplies. However, it is usually necessary to do considerable test-drilling before finding a satisfactory location. . . .

Unclassified, high-level gravel, sand and clay - The high-level gravel usually is a poor aquifer because of more or less clay in the strata. However, lenses of cleaner sands and gravels do occur, especially where the beds are thicker. In some places, the crystalline rocks are very poor aquifers, and the possibility of obtaining a supply of water from a pocket of sand in the high-level gravels should not be overlooked. . . .

Pleistocene formations - These formations are cross-bedded in many places and consist of sands, clays, and mixtures of sand and clay. They contain quartz pebbles in some exposures, expecially at the base of the formation. They furnish most domestic supplies in areas where they occur. The older of these formations, including the Brandywine and parts of the Coharie, only rarely have lenses of clean sand with good permeability. Usually, the water is furnished by argillaceous sands, and the permeability is so low that dug wells must be used. By using dug wells with considerable storage-capacity, one hundred gallons a day can be taken from the well, even though it will yield at a rate of only a fraction of a gallon a minute. Where the sands are more permeable, hand-bored or machine-drilled wells can be utilized, and this is particularly true of the younger Pleistocene formations, including the Sunderland, Wicomico, and Penholway. Frequently, wells are bored with a 6 or 8-inch auger and a 1¼-inch pipe placed in the well to withdraw the water. Often, trouble is experienced because of the sand caving in at the bottom of the well and coming into the bottom of the draw pipe. This can usually be overcome by placing pea-size gravel around the bottom of the pipe as is done in gravel-walled wells. It probably would be advisable to use a coarse screen or strainer at the end of the draw pipe, or to perforate, or slot, the end of the pipe to permit free entrance of the water. It should be remembered that wells drilled in these formations are shallow and, therefore, more liable to contamination than deeper wells. If it is necessary to utilize this shallow ground-water, the precautions, outlined hereinbefore in the fourth paragraph in this chapter under "Utilization of ground water", should be observed.

Ground Water in the Fall Zone - This area presents some of the most

difficult problems of ground-water supply in Halifax, Nash, and Edgecombe Counties. Although there is no easy solution of the problem, careful planning will assist greatly in developing adequate water-supplies in that area. In the first place, no one source can be designated as the best, and all possible sources should be investigated. The records of the previous wells in the vicinity of a given location will give very valuable clues as to the possibilities of the various sources.

At Whitakers, it has been practically impossible to get even moderate supplies from the bedrock. The overlying sediments made it impossible to base the location of a well on topographical and geological evidence, and a well, drilled into the bedrock under such conditions, has little chance of obtaining more than a small supply of water. Unless records of other wells are very favorable, it appears that these rocks should only be considered as a last resort.

Permeable sands, at the base of the Sunderland formation, have proven a satisfactory source for the Towns of Enfield and Whitakers and for a number of industrial and domestic supplies all along this zone. Usually, these sands are not more than 25 to 40 feet deep and are frequently overlooked as a source of supply for towns and industires. These sands should be considered thoroughly in searching for a ground-water supply along the Fall Zone. Since the sands are lenticular, it may require a considerable amount of test drilling, but a large number of test holes can be drilled in this formation for the price of one deep well. Shallow wells have certain disadvantages, such as decreasing yield during periods of drought and increased danger of pollution. Decreased yield can be minimized by spacing the wells over a considerable area and by choosing an area where the normal water-table does not decline too far below the surface. Danger of pollution can be guarded against by removing any possible source of pollution for at least several hundred feet from the well field.

Another possible source of supply is sand lenses occurring in the Miocene deposits from 45 to 70 feet below the surface. Such permeable sand-lenses, if they can be found, are apt to have certain advantages over the shallower sands. Usually, fewer wells will be required, less decrease in yield will occur during periods of drought, and there is less danger of pollution. Such sand lenses should not be overlooked as a possible source of supply in parts of the area where they occur.

The Cretaceous strata apparently occur in isolated patches along the Fall Zone and are a possible source, although no satisfactory water-supplies are definitely known to have been obtained in this source in this zone. However, a few miles east of the Fall Zone, the Cretaceous formation becomes thicker and is the most important source of supply. Properly-constructed wells in it usually will furnish moderate to large supplies, and there is little danger of decreased yield during drought. . .

Edgecombe County - Nearly all domestic water-supplies are obtained from the ground, mostly from wells. Only a few springs are used. The majority of wells are shallow and obtain their water from the Pleistocene formations. Bored and driven wells predominate, only a few dug wells being used. Bored wells are used where the strata contain some clay or where clay layers are found above the water-bearing stratum, because of the difficulty in driving wells under such conditions. In the vicinity of Pinetops, Macclesfield, and Sharpsburg, bored wells predominate, and many bored wells are also used east of Battleboro and Whitakers. In the eastern part of the county, driven wells are more plentiful. The reason for this is that the water table is generally closer to the surface there, and also that the lower terrace-formations contain a greater proportion of sand which is favorable to driving wells.

In some places, the marl of the Yorktown formation is close to the surface, and shallow wells must get their water from this formation. Usually, only small supplies are obtained, the water from most of the wells is hard and, from some wells, the taste and odor of the water are unpleasant. For this reason drilled wells are more common in these places than elsewhere. This is especially true of the area around Speed.

Records were obtained for about 100 wells in the county. Only a few drilled-wells, that end in the York formation, are used. Most of the drilled wells end in the Cretaceous formation. About the only wells, drilled in the Yorktown formation, are a few, drilled in the western part of the county, where the Cretaceous sediments are absent or are too thin to furnish any water. The Yorktown formation furnishes only small amounts of water to drilled wells, and the water usually is quite hard.

Except for a strip three to five miles wide along the western part of the county, most of the wells, ending in the Cretaceous deposits, have been successful in obtaining satisfactory supplies of water and, even in that strip, there are a number of successful wells ending in the Cretaceous formation. As these strata consist of inter-fingering lenses of sand and clay, the success of a well depends on striking a permeable sand-lens. The chances of striking a permeable sand-stratum in the formation are generally favorable if the thickness is more than 60 or 80 feet; therefore, the chances for finding a good aquifer increase eastward as the thickness of the formation increases.

Two areas, in which a number of failures have been recorded, are in the vicinity of Macclesfield and north of Leggett. The reason for the failures appear to lie in the fineness of the sand. However, other wells in these areas have been fairly successful, and it appears that moderate supplies can be developed there by using the proper size of screen and careful development of the well. Larger supplies could probably be obtained from gravel-walled wells.

The only flowing wells in the county are found along the Tar River at Tarboro and Princeville and near Old Sparta. All of these wells end in Cretaceous strata. It is probable that flowing wells could also be obtained along Deep Creek near Speed and possibly at places along Fishing Creek and Town Creek.

No large supplies have been obtained from Cretaceous deposits within the county probably because, except for the City of Tarboro, no large supplies of water are needed. Quantities obtained have generally proven very adequate to supply the demand. Comparison of the logs and the records of the wells with like records, from other areas where large amounts of water have been obtained from beds of Cretaceous age, indicates that large supplies of water, possibly 500 or more gallons a minute, can probably be obtained from properly-constructed, screened wells. . . .

Halifax County - Nearly all domestic water-supplies, a number of industrial supplies, and the municipal supplies of the Town of Enfield are obtained from wells. The principal source of domestic supplies is shallow wells.

In the western part of the county, most of the wells are dug and are from 30 to 60 feet deep. These wells yield water from the weathered, crystalline bedrock, or from the sandy clays of the high-level gravels, or from the Brandywine or Coharie formations. Through the central part of the county, both dug and bored wells are used. Bored wells are used mainly where the terrace deposits are thick and permeable enough to furnish a satisfactory supply without the necessity of depending on the larger storage-capacity of the dug wells. Where the

material is very fine, clayey, and of very low permeability, dug wells predominate. Through the eastern part of the county, bored and driven wells are most common. A few dug wells are also used in this area, expecially where the terrace deposits contain a considerable amount of clay.

In that part of the area lying west of U. S. Highway 301, most of the drilled wells obtain their waterfrom the crystalline bedrock, and a few get their water from relatively-shallow sands and gravels at the base of the terrace deposits. Of about 65 wells drilled in the crystalline rock, only three or four yielded less than 2 gallons a minute. All of these wells are in granite. Few of the wells in the crystalline rocks yield more than 20 or 25 gallons a minute and, if larger supplies are needed, the chances are that more than one well will be necessary. All the failures were in granite and, in general, the wells in the slate, schist, and gneiss yield more satisfactory supplies than in the granite. Some of the wells obtain fairly-large supplies from the weathered and disintegrated bedrock which overlies the solid rock, and it is probable that more wells obtain their water from this zone than the reported records indicate. One of the most difficult areas in which to obtain adequate municipal and industrial supplies is the Fall Zone. It appears that relatively-shallow wells are the most satisfactory, either utilizing a number of well points in a "well field" which can be pumped by one centrally-located pumping plant or using one or more gravel-walled wells.

In the area a few miles east of U.S. Highway 301, satisfactory supplies have usually been obtained from wells drilled into the lenticular sand-beds of the Cretaceous strata. As these strata probably pinch out at or near Enfield, it is quite thin for two or three miles eastward. Large supplies probably can be obtained by properly-constructed wells in the Cretaceous strata in the eastern one-third of the county. The strata are lenticular, and the fact, that satisfactory wells are obtained at a given depth in a certain locality, does not assure that permeable sand-strata will be at the same depth some distance away. In this area, however, conditions are favorable for penetrating a permeable lens of sand in the Cretaceous formation at some depth.

A few wells, from 40 to 80 feet deep, obtain their water from the Yorktown formation, but usually even the more-sandy strata contain so much clay as to be nearly impermeable. Most domestic wells in this formation yield only small amounts of water, and often the taste and odor of the water are bad. . . .

Nash County - There are a considerable number of drilled wells in the county, although most of the domestic wells are dug, bored, or driven. Most of the shallow domestic-wells yield water from the terrace formation or from decayed and disintegrated rock in the upper part of the crystalline bedrock. Most drilled wells obtain their supplies from the crystalline rocks, with a few wells obtaining supplies from the Yorktown formation. Most of the western two-thirds of Nash County is underlain by the metamorphic slates and schist, and moderate supplies are obtained in these rocks. A well, at a cotton gin at Taylor's Store was reported to have yielded 60 gallons a minute. Pumped at the maximum capacity of a pitcher pump, about 15 gallons a minute, the water level lowered only to 3.5 feet below the surface, a drawdown of 2.5 feet. Each of several wells in the schist at Red Oak yield from 20 to 45 gallons a minute. The main city-well at Nashville yields 300 gallons a minute, while several others yield 25 to 100 gallons a minute. The two town-wells at Spring Hope yield 75 and 155 gallons a minute each, respectively, and each of a number of other wells yield from 20 to 40 gallons a minute. Besides the examples given, which are 6-inch or 8-inch wells, a large number of $1\frac{1}{4}$-inch, jetted or

"washed-down" wells are used for domestic purposes. These wells yield satisfactory supplies for domestic purposes. Wells, drilled in the granite area around and south of Castalia, have usually not been so successful as a well in the metamorphic rock, and several wells in this granite area have been complete failures. Wells, drilled in the granite belt in the eastern third of the county, show considerable variation in yield. Yields from zero to 45 gallons a minute have been reported. It appears that wells, drilled in the granite along the western margin of the belt near the contact with schist, are considerably better than wells drilled farther from the contact. The average yield of five wells, in the granite near the contact, is about 16 gallons a minute while the average yield of 18 wells, two or more miles from the contact, is about nine gallons a minute.

A few wells, near Rocky Mount and at Whitakers, are drilled or bored into more-sandy strata of the Yorktown formation. Usually, the supply is small, and a considerable number of wells in this formation have been abandoned because of the bad odor and taste of the water.

There are many springs in Nash County, a few of which furnish domestic water-supplies. Most of these are either depression or contact springs most of which furnish only a few gallons a minute. One of the strongest, on the farm of J. W. Moore about one mile south of Red Oak, flows about 40 gallons a minute. This is a contact spring. The water issues at the base of a permeable, arkosic sand-stratum lying upon an impermeable clay-stratum. Both of these strata belong to the Coharie formation. There is a thin band of gravelly sand just above the clay. The water issues from this layer, several feet above the bottom, in the side of a gully. A hydraulic ram is used to deliver water to an elevated tank. Harris Spring, in Taylor Park at Rocky Mount, is another contact spring, brought to the surface by the intersection of underlying, massive granite with the surface. The main spring, emptying into a round concrete-basin, yields about one gallon per minute, and there are a considerable number of other small seeps in addition.

Public Water Supplies - Descriptions and chemical character of public supplies of water, both surface water and ground water, are contained in Chapter II of this publication.

Chemical Character of Surface Waters - The following material, taken from Bulletin 52, Volumes 1-12, inclusive, published annually by the North Carolina Department of Conservation and Development and prepared cooperatively by by the Geological Survey, U. S. Department of the Interior, comprises analyses of samples of surface waters in the Tar-Pamlico River Basin, collected, during the period from October 1, 1944 to September 30, 1956, daily for some stations, and monthly for other stations, at or near points where continuous stream-measurement stations were maintained. The water year of the Geological Survey ends on September 30 of each year. In addition to the daily and monthly stations, samples were also collected periodically at miscellaneous stream-measurement sites. This additional data made it possible to predict the chemical character of the stream at various points within the Tar-Pamlico River Basin. Information regarding definitions and limits of tolerance, pertaining to hardness, conductivity, pH, suspended matter, color, oxygen consumed, dissolved solids, and other characteristics of quality of water as determined by chemical analyses, may be found in each of the twelve volumes indicated above and also on pages 80-84, inclusive, of "Water Resources of North Carolina", published by the North Carolina Department of Conservation and Development, in January 1955, comprising Volume I of a series, consisting of inventories of the water resources of the State, of which this publication is Volume IX.

Bath Creek at Bath, Beaufort County

Date	2-25-49	9-14-54	9-30-54	11-4-54	11-30-54	2-17-55	6-1-55
Color	37						
pH	6.3	7.2	7.4	7.2	7.0	7.3	7.3
Specific conductance	3,980	17,500	17,700	23,700	24,700	17,400	19,600
Silica	7.2						
Iron	0.04						
Calcium	36			199	207	128	161
Magnesium	74			602	665	456	499
Na + K	664						
Bicarbonate	24	76	82	86	89	63	63
Sulfate	160	871	931	1,300	1,420	942	1,060
Chloride	1,170	6,470	6,680	9,000	9,740	6,530	7,370
Nitrate	1.3						
Dissolved solids	2,230						
Total hardness	304	2,080	2,180	2,970	3,250	2,190	2,460

Cedar Creek near Louisburg, Franklin County

Date	4-13-54	7-14-54	9-16-54	7-1-55	11-19-55	1-12-56
Discharge, c.f.s.	43.9	8.99	5.43	8.20	19.9	25.8
Silica		24		24	24	
Iron				0.28	0.97	
Calcium		3.4	3.2	3.8	4.5	4.2
Magnesium		0.9	1.2	1.2	1.7	1.2
Na + K		7.8		7.4	8.4	
Bicarbonate	25	25	26	30	35	30
Sulfate	3	2.6	1	1.2	1.7	1.6
Chloride	3.8	3.8	4.0	4.0	3.5	3.5

Cedar Creek (cont'd.)

	4-13-54	7-14-54	9-16-54	7-1-55	11-19-55	1-12-56
Fluoride		0.1				
Nitrate		0.3	1.0	0.9	0.2	0.5
Dissolved solids		60		58	62	
Hardness	13	12	13	15	18	16
Specific conductance	55.9	60.7	52.2	67.8	70.7	62.0
pH	6.9	7.0	5.7	6.6	6.7	6.8
Color		5		28	37	

Crooked Creek near Bunn, Franklin County

Date	7-1-55	11-19-55	1-12-56	9-20-56
Discharge, c.f.s.	5.43	13.5	17.3	4.49
Silica	22	22	- -	- -
Iron	0.87	1.5	- -	- -
Calcium	3.1	2.8	2.2	- -
Magnesium	0.5	1.2	0.7	- -
Na + K	7.4	81	- -	- -
Bicarbonate	23	28	20	26
Sulfate	1.5	1.2	0.8	1.2
Chloride	3.0	3.5	3.5	3.2
Fluoride	0.1			
Nitrate	0.9	0.1	0.7	
Dissolved solids	50	54	- -	- -
Hardness	10	12	8	10
Specific conductance	54.2	58.5	46.9	53.2
pH	6.6	6.6	6.8	7.1
Color	32	80	- -	- -

Cherry Run near Washington, Beaufort County

Date	4-21-49	4-18-50	9-2-50
Discharge, c.f.s.	0.91	0.48	0.06
Color	45	17	
pH	6.3	6.3	6.6
Specific conductance	69.7	107	113
Silica	15	28	
Iron	0.31	0.42	
Calcium	4.4	8.6	
Magnesium	1.0	2.0	
Na + K	8.4	10	
Bicarbonate	20	37	48
Sulfate	5.7	6.7	1
Chloride	7.2	10	7.5
Fluoride	0.2	0.1	
Nitrate	0.4	0.5	
Dissolved solids	78	97	
Total hardness	15	30	34

Cypress Creek near Bunn, Franklin County

Date	4-13-54	7-14-54	11-19-55	1-12-56	9-20-56
Discharge, c.f.s.	40.6	2.39	12.2	22.1	1.71
Silica		15	21		
Iron		0.40	1.1		
Calcium		3.4	3.0	2.5	

Cypress Creek near Bunn (cont'd.)

	4-13-54	7-14-54	11-19-55	1-12-56	9-20-56
Magnesium		1.3	1.5	0.9	
Na + K		6.9	8.7		
Bicarbonate	19	26	27	22	29
Sulfate	3	2.4	1.4	1.2	0.2
Chloride	3.8	3.5	4.0	3.5	3.2
Fluoride		0.1	0.1		
Nitrate		0.3	0.1	0.8	
Dissolved solids		57	54		
Hardness	11	14	14	10	14
Specific conductance	48.2	59.5	61.0	49.3	57.5
pH	6.5	6.3	6.7	6.8	7.0
Color		17	75		

Durham Creek at Edward, Beaufort County

Date	5-27-50	8-20-50	9-28-50	5-25-51	6-5-51	10-26-51	9-10-52
Discharge, c.f.s.	14.5	1.43	2.69	0.816		2.18	0.17
Color	160						
pH	4.8	5.1	5.2	5.3	7.2	5.2	7.0
Specific conductance	34.7	39.0	42.6	37.1	361	35.3	387
Silica	7.5						
Iron	0.32						
Calcium	2.1						
Magnesium	0.6						
Na + K	3.2						
Bicarbonate	5	6	8	6	213	4	240
Sulfate	2.4	3	1	2	1	2	1
Chloride	5.5	3.8	6.0	6.2	6.8	5.8	5.5
Nitrate	0.3						
Dissolved solids	58						
Total hardness	8	10	10	8	160	9	189

Durham Creek at Edward (cont'd.)

Date	4-28-53	9-2-53	2-18-54	4-9-54	2-2-56	9-19-56
Discharge, c.f.s.	2.45	1.18	11.8	34.8	28.4	0
Calcium					3.2	43
Magnesium					1.3	5.1
Bicarbonate	5	6	1	3	5	174
Sulfate	1	1	3	1	4.5	2.3
Chloride	6.2	7.0	5.8	5.5	8.5	6.5
Nitrate						3.0
Hardness	10	10	7	8	13	129
Specific conductance	38.4	44.7	44.1	39.6	48.0	289
pH	5.4	5.6	4.8	5.3	5.7	7.1

Fishing Creek near Lawrence, Edgecombe County

Date	1-6-47	Na + K	8.0
Discharge, c.f.s.	- -	Bicarbonate	29
Color	20	Sulfate	4.6
pH	7.0	Chloride	5.4
Silica	16	Fluoride	0.4
Iron	0.06	Nitrate	0.2
Calcium	4.5	Dissolved solids	66
Magnesium	2.1	Total hardness	20

Fishing Creek near Enfield, Halifax County

Date	1-6-47	10-1-48/9-30-49 incl. (average)	2-15-55	8-31-55	2-1-56	8-1-56
Discharge, c.f.s.	531	718	620	137	257	398
Color	23	15	-	37	8	10
pH	6.9	6.6	6.6	6.6	7.3	6.4
Silica	15	15	-	19	15	15
Iron	0.04	0.08	-	0.46	0.60	0.02
Calcium	4.8	4.5	2.6	5.2	4.7	4.6
Magnesium	2.1	1.9	1.3	1.8	1.8	1.7
Na + K	6.0	5.4	-	7.9	6.4	5.6
Bicarbonate	27	27	13	29	33	24
Sulfate	4.0	3.1	2	2.9	1.9	2.2
Chloride	4.8	3.8	2.8	5.5	4.5	2.2
Fluoride	0.2	0.1	-	0	0	0.1
Nitrate	0.2	0.5	0.9	1.7	0.1	1.4
Dissolved solids	59	54	46	58	51	45
Total hardness	21	19	12	20	19	18
Temperature		60				
Suspended matter		36				
Oxygen consumed						
Filtered		6.5				
Unfiltered		4.8				
Specific conductance		61.9	49.4	78.9	73.0	56.7

Fishing Creek near Warrenton, Warren County

Date	8-11-49	12-19-49	4-15-50	8-29-50	7-13-51	9-14-51	9-10-52
Discharge, c.f.s.	16.5	42.9	32.9	13.2	7.54	6.15	22.0
Color	6						
pH	6.4	6.7	6.8	7.0	5.7	7.0	6.9
Specific conductance	28.0	60.4	60.5	62.7	65.4	70.9	60.3
Silica	19						
Iron	0.17						
Calcium	4.2						
Magnesium	2.1						
Na + K	5.4						
Bicarbonate	28	24	30	31	32	34	29
Sulfate	1.8	2	2	1	1	1	1
Chloride	4.0	3.8	3.0	3.0	3.2	4.0	3.2
Fluoride	0.1						
Nitrate	0.3						
Dissolved solids	58						
Total hardness	19	14	17	17	18	21	19

Fishing Creek near Warrenton (cont'd.)

Date	10-28-52	4-28-53	8-29-53	4-13-54	7-14-54	9-17-54	7-7-55	11-23-55
Discharge, c.f.s.	19.1	30.1	3.41	32.3	5.30	2.23	5.44	29.3
Silica							20	
Iron							0.28	
Calcium						4.0	5.2	2.6
Magnesium						1.2	1.3	2.2
Na + K							6.6	
Bicarbonate	29	30	28	27	28	29	32	24
Sulfate	1	2	2	2	1	2	1.0	2.3
Chloride	3.2	2.5	4.0	3.2	3.5	3.5	3.2	3.5

Fishing Creek near Warrenton (cont'd.)

	10-28-52	4-28-53	8-29-53	4-13-54	7-14-54	9-17-54	7-7-55	11-23-55
Nitrate							0.8	1.0
Dissolved solids							54	
Total hardness	21	18	19	16	18	15	18	16
Specific conductance	58.8	63.6	57.4	57.4	58.9	66.7	67.5	55.4
pH	6.6	6.6	7.1	7.0	7.0	6.7	6.8	6.8
Color							27	

Fishing Creek near Wood, Franklin County

Date	1-7-47	Na + K	6.3
Discharge, c.f.s.	-	Bicarbonate	30
Color	10	Sulfate	3.7
pH	7.0	Chloride	3.9
Silica	16	Fluoride	0.2
Iron	0.06	Nitrate	0.2
Calcium	4.8	Dissolved solids	54
Magnesium	2.2	Total hardness	21

Grindle Creek near Pactolus, Pitt County

Date	6-4-53	7-29-53	9-2-53	9-17-53	2-2-56	9-19-56
Discharge, c.f.s.	5.82	2.37	1.37	.779	34.5	6.26
Calcium				9.2	8.8	10
Magnesium				2.2	1.0	2.1
Bicarbonate	21	22	23	17	12	23
Sulfate	24	21	16	27	21	22
Chloride	11	10	10	9.8	11	10
Nitrate				0.8	1.9	2.2
Hardness	38	34	34	32	26	34
Specific conductance	141	139	138	135	116	135
pH	6.4	6.5	6.1	6.3	6.1	6.3

Grindle Creek at Pactolus, Pitt County

Date	4-20-49	4-18-50	9-2-50	10-3-50	11-29-50	6-5-51
Discharge, c.f.s.	24.1	14.4	8.75	12.7	6.31	4.93
Color	17					
pH	6.2	6.3	6.5	6.4	6.3	6.4
Specific conductance	91.2	108	117	114	126	129
Silica	13					
Iron	0.11					
Calcium	6.9					
Magnesium	1.8					
Na + K	7.0					
Bicarbonate	12	20	19	20	26	25
Sulfate	17	17	12	33	13	28
Chloride	7.8	8.8	8.2	8.5	9.0	9.2
Fluoride	0.1					
Nitrate	1.3					
Dissolved solids	76					
Total hardness	25	27	28	29	30	28

Grindle Creek at Pactolus, Pitt County (cont'd.)

Date	10-25-51	9-11-52	10-30-52	4-28-53	2-18-54	4-8-54
Discharge, c.f.s.	2.85	4.51	1.00	14.6	33.7	63.9
Bicarbonate	27	23	23	14	13	8
Sulfate	14	30	20	27	20	26
Chloride	9.2	9.2	9.2	12	10	9.5
Total hardness	31	33	38	33	33	27
Specific conductance	132	134	130	131	131	109
pH	6.5	6.7	6.3	6.2	6.2	6.0

Herring Run near Washington, Beaufort County

Date	4-22-49	1-19-50	3-9-50	4-18-50	8-20-50	8-27-50	9-30-54
Discharge, c.f.s.	4.14	8.70	2.93	1.50	5.55	2.97	
Color	21	9					
pH	5.6	5.7	6.2	6.3	5.7	6.0	7.4
Specific conductance	79.0	55.8	77.2	119	58.0	76.0	237
Silica	20	14					
Iron	0.10	0.03					
Calcium	7.0	3.6					
Magnesium	1.2	1.3					
Na + K	5.4	4.8					
Bicarbonate	10	8	9	23	7	11	106
Sulfate	18	9.5	17	28	14	18	9
Chloride	5.0	5.5	6.2	6.8	5.8	6.0	10
Fluoride		0.1					
Nitrate	0.1	0.4					
Dissolved solids	80	57					
Total hardness	22	14	20	37	15	20	85

Herring Run near Washington (cont'd.)

Date	11-4-54	11-30-54	2-3-55	2-17-55	6-1-55	8-31-55	1-26-56	9-19-56
Discharge, c.f.s.			0.873			19.9	12.5	29.5
Silica						12	11	7.5
Iron						1.1	0.71	0.38
Calcium	34	34	14	25	17	1.6	2.8	2.6
Magnesium	4.1	5.4	2.2	4.1	2.1	1.1	1.0	0.4
Na + K						7.3	6.3	4.5
Bicarbonate	107	104	33	72	54	2	2	0.3
Sulfate	21	23	29	21	16	7.9	11	8.0
Chloride	36	58	8.0	26	16	8.5	7.8	2.5
Fluoride								0.1
Nitrate						0.3	0.5	0.5
Dissolved solids			128			41	42	27
Hardness	103	106	43	79	52	9	11	8
Specific conductance	362	1,000	146	253	223	64.3	67.9	50.8
pH	7.0	7.0	6.7	7.0	6.8	4.9	5.0	4.9
Color						70	15	100

Herring Run at Washington

Date	9-14-54	9-30-54	11-4-54	11-30-54	2-19-55	6-1-55
Calcium			120	124	16	66
Magnesium			306	376	27	178
Bicarbonate	76	60	61	72	24	45
Sulfate	890	365	666	773	69	389
Chloride	6,470	2,680	4,550	5,390	400	2,700

Herring Run at Washington (cont'd.)

Date	9-14-54	9-30-54	11-4-54	11-30-54	2-19-55	6-1-55
Hardness	2,130	900	1,560	1,860	150	896
Specific conductance	17,700	8,090	13,400	15,300	1,470	8,250
pH	7.1	7.0	7.0	6.6	6.6	6.5

Little Fishing Creek near Brinkleyville, Halifax County

Date	9-16-54	Chloride	4.5
Calcium	6.0	Nitrate	0.5
Magnesium	1.9	Hardness	23
Bicarbonate	39	Specific conductance	94.6
Sulfate	1	pH	6.6

Lynch Creek near Louisburg, Franklin County

Date	4-13-54	Hardness	9
Discharge, c.f.s.	21.9	Specific conductance	47.0
Bicarbonate	18	pH	6.6
Sulfate	2	Chloride	3.2

Pamlico River at Washington, Beaufort County

Date	9-9-49	Na + K	4.1
Color	55	Bicarbonate	12
pH	5.9	Sulfate	5.7
Specific conductance	62.6	Chloride	6.5
Silica	7.2	Fluoride	0
Iron	0.67	Nitrate	0.5
Calcium	4.3	Dissolved solids	56
Magnesium	1.4	Total hardness	16

Pantego Creek at Belhaven, Beaufort County

Date	9-14-54	9-30-54	11-4-54	11-30-54	2-17-55	6-1-55
Calcium			203	246	159	176
Magnesium			654	766	576	547
Bicarbonate	71	75	82	97	74	65
Sulfate	948	964	1,370	1,590	1,180	1,150
Chloride	6,870	4,840	9,430	11,200	8,270	7,870
Hardness	2,290	2,260	3,200	3,770	2,770	2,690
Specific conductance	18,300	18,200	25,100	27,700	21,400	21,000
pH	6.9	7.3	7.1	7.1	7.0	7.0

Pungo Creek near Belhaven, Beaufort County

Date	9-14-54	9-30-54	11-4-54	11-30-54	2-17-55	6-1-55
Calcium			214	230	151	180
Magnesium			647	774	516	548
Bicarbonate	63	77	79	94	65	62
Sulfate	837	1,030	1,350	1,560	1,090	1,140
Chloride	6,040	7,270	9,580	11,100	7,570	8,070
Hardness	1,980	2,390	3,200	3,760	2,500	2,700
Specific conductance	16,500	19,100	25,100	27,700	19,700	21,500
pH	6.7	7.3	7.1	7.0	7.1	7.0

Pungo Creek at Yeatsville, Beaufort County

Date	9-14-54	9-30-54	11-4-54	11-30-54	2-17-55	6-1-55
Calcium			207	230	132	143
Magnesium			545	743	458	459
Bicarbonate	41	67	67	83	61	57
Sulfate	598	790	1,220	1,560	973	947
Chloride	4,050	5,640	8,110	10,500	6,580	6,730
Hardness	1,400	1,890	2,760	3,630	2,210	2,240
Specific conductance	11,700	15,400	21,800	26,800	17,800	18,100
pH	6.4	6.8	6.8	6.8	6.8	6.7

Pungo River at Leechville, Beaufort County

Date	9-14-54	9-30-54	11-4-54	11-30-54	2-17-55	6-1-55
Calcium			214	222	128	140
Magnesium			644	729	473	459
Bicarbonate	46	57	81	88	61	54
Sulfate	656	752	1,350	1,520	986	954
Chloride	4,690	5,370	10,000	10,500	6,780	6,630
Hardness	1,540	1,770	3,190	3,550	2,260	2,240
Specific conductance	13,300	14,800	25,100	26,400	18,200	18,100
pH	6.8	6.9	7.3	7.0	6.9	7.0

Sandy Creek near Alert, Franklin County

Date	7-1-55	11-23-55	1-11-56	9-20-56
Discharge, c.f.s.	7.50	33.5	36.0	9.06
Silica	18			
Iron	0.47			
Calcium	3.8	3.2	3.9	
Magnesium	1.2	1.5	1.2	
Na + K	7.1			
Bicarbonate	26	25	24	27
Sulfate	1.8	2.7	1.8	1.1
Chloride	4.5	4.5	3.5	3.5
Nitrate	0.5	0.9	1.0	
Dissolved solids	50			
Hardness	14	14	15	13
Specific conductance	62.5	59.7	56.7	55.7
pH	6.7	6.8	6.8	6.8
Color	32			

Sapony Creek near Nashville, Nash County

Date	8-14-49	4-17-50	8-28-50	10-9-50	2-15-55	8-31-55	2-1-56	7-31-56
Discharge, c.f.s.	2.71	14.2	30.7	46.7	32.4	36.6	250	70.5
Color	29						18	130
pH	6.4	6.6	6.7	6.4	6.6	6.6	6.7	6.9
Specific conductance	71.5	86.3	61.4	65.0	71.6	68.6	75.2	58.0
Silica	14						8.7	10
Iron	0.09						0.58	0.48
Calcium	6.2				6.2	5.8	5.8	5.2
Magnesium	2.4				0.4	2.3	1.8	1.9
Na + K	5.2					5.2	6.3	2.9
Bicarbonate	32	39	25	24	9	28	28	23

Sapony Creek near Nashville (cont'd.)

Date	8-14-49	4-17-50	8-28-50	10-9-50	2-15-55	8-31-55	2-1-56	7-31-56
Sulfate	2.7	2	3	4	6	2.2	1.6	2.4
Chloride	4.8	5.5	4.0	5.5	6.0	4.8	6.0	3.1
Fluoride	0.3							0.1
Nitrate	0.2				0.1	0.7	0.3	2.4
Dissolved solids	63				69	47	45	39
Total hardness	25	29	19	26	17	24	22	21

Shelton Creek near Oxford, Granville County

Date	8-10-49	12-12-49	4-15-50	8-29-50	7-13-51	9-10-52	10-29-52	4-24-53	8-29-53
Disch.c.f.s.	.546	4.04	4.70	0.88	.532	3.61	1.68	10.2	0.11
Color	12								
pH	6.6	6.9	6.9	6.9	6.6	7.1	7.0	6.6	6.8
Specific conductance	75.7	85.8	86.9	76.0	92.0	69.5	92.1	68.4	92.2
Silica	12								
Iron	0.04								
Calcium	6.0								
Magnesium	2.8								
Na + K	5.4								
Bicarbonate	37	42	42	39	44	33	47	32	48
Sulfate	3.2	4	3	4	7	3	2	2	1
Chloride	2.8	4.5	3.8	3.0	3.2	3.2	3.8	3.5	4.0
Fluoride	0.1								
Nitrate	0.5								
Dissolved solids	55								
Hardness	26	30	31	26	33	24	36	24	22

Shocco Creek near Centerville, Franklin County

Date	9-16-54	Chloride	3.5
Discharge, c.f.s.	2.10	Nitrate	0.3
Calcium	5.2	Dissolved solids	
Magnesium	2.2	Hardness	22
Bicarbonate	35	Specific conductance	72.9
Sulfate	1	pH	6.7

Shocco Creek near Elberon, Warren County

Date	7-1-55	11-22-55	1-11-56	9-20-56
Discharge, c.f.s.	2.52	10.9	16.8	3.88
Silica	15			
Iron	0.03			
Calcium	4.3	3.2	3.6	
Magnesium	1.0	1.4	1.2	
Na plus K	6.4			
Bicarbonate	27	27	24	29
Sulfate	2.0	2.4	1.9	0.8
Chloride	3.5	3.4	3.0	3.0
Nitrate	0.9	1.3	0.3	
Dissolved solids	46			
Hardness	15	14	14	16
Specific conductance	61.9	54.2	53.0	60.1
pH	6.5	6.7	6.7	7.1
Color	13			

Swift Creek near Red Oak, Nash County

Date	8-14-49	4-17-50	8-23-50	10-3-50	11-30-50	6-5-51
Discharge, c.f.s.	58.7	95.5	40.8	60.4	72.9	36.3
Color	7					
pH	6.5	6.5	6.9	6.9	6.4	7.0
Specific conductance	39.8	67.6	72.0	63.9	58.4	69.1
Silica	20					
Iron	0.05					
Calcium	5.0					
Magnesium	2.1					
Na plus K	5.4					
Bicarbonate	30	32	31	26	24	34
Sulfate	2.2	1	2	2	3	1
Chloride	3.8	3.5	3.8	3.8	4.5	4.0
Fluoride	0.1					
Nitrate	0.4					
Dissolved solids	60					
Hardness	21	21	16	16	13	20

Swift Creek (cont'd.)

Date	10-17-51	9-10-52	10-28-52	8-31-53	7-14-54	9-17-54
Discharge, c.f.s.	26.6	80.7	48.0	23.7	26.1	8.76
Calcium						5.6
Magnesium						1.7
Bicarbonate	27	25	31	30	31	34
Sulfate	3	4	2	3	1	1
Chloride	4.2	4.0	4.2	4.5	3.5	4.0
Nitrate						0.8
Hardness	18	18	22	19	17	21
Specific conductance	68.6	60.0	67.9	70.5	64.2	88.9
pH	6.6	7.1	6.5	6.8	7.1	6.6

Tabbs Creek near Kittrell, Vance County

Date	8-10-49	12-12-49	4-15-50	8-29-50	7-13-51	9-14-51
Discharge, c.f.s.	11.5	31.7	21.6	8.84	6.52	
Color	6					
pH	6.7	7.0	7.0	7.0	6.8	7.2
Specific conductance	85.4	95.9	101	95.7	102	102
Silica	22					
Iron	0.04					
Calcium	7.4					
Magnesium	3.1					
Na + K	8.5					
Bicarbonate	46	44	48	46	48	49
Sulfate	2.9	4	2	1	1	2
Chloride	6.0	6.5	5.5	5.8	6.8	5.5
Fluoride	0.1					
Nitrate	0.3					
Dissolved solids	78					
Total hardness	31	29	41	28	29	37

Tabbs Creek near Kittrell (cont'd.)

Date	9-10-52	10-29-52	4-24-53	8-29-53	7-14-54	9-17-54	11-23-55	1-11-56
Disch. c.f.s.	18.2	11.0	46.3	1.82	3.64	.784	28.8	25.3
Calcium							6.4	7.6
Magnesium						7.2	3.1	2.7
Bicarbonate	36	49	38	45	43	45	44	45
Sulfate	3	2	5	1	3	1	4.6	3.2
Chloride	5.0	6.3	5.5	4.8	4.5	4.2	6.0	6.0
Nitrate						0.7	1.0	0.6
Hardness	28	38	26	28	23	28	29	30
pH	6.8	6.8	6.9	7.2	7.1	6.8	7.0	7.0
Specific conductance	90	103	85.1	86	86	89.3	98.5	96.2

Tar River at Greenville, Pitt County

Date	1-6-47	9-15-48	Oct. 1955 to Sept. 1956 Average
Discharge, c.f.s.	2,560		
Color	27	8	45
pH	6.0	7.2	
Silica	9.0	18	12
Iron	0.03	0.04	0.27
Calcium	4.5	5.1	5.2
Magnesium	1.8	1.9	1.6
Na + K	7.1	6.2	8.0
Bicarbonate	22	29	22
Sulfate	5.5	3.5	5.5
Chloride	6.2	4.1	6.6
Fluoride	0.4	0.2	
Nitrate	0.5	0.4	2.0
Dissolved solids	58	62	63
Hardness	19	20	22
Specific conductance			79.0

Tar River near Greenville, Pitt County

Date	11-4-54	Chloride	11
Discharge, c.f.s.	335	Hardness	26
Calcium	7.6	pH	6.6
Magnesium	1.7	Specific conductance	120
Bicarbonate	32	Sulfate	13

Tar River at Grimesland, Pitt County

Date	3-19-46	9-14-49	Oct. 1955 to Sept. 1956 average
Color	29	27	45
pH		6.1	
Silica	8.2	15	12
Iron	0.08	0.62	0.25
Calcium	5.2	4.6	5.8
Magnesium	1.7	1.4	1.6
Na + K	6.1	5.9	8.9
Bicarbonate	25	18	23
Sulfate	4.5	6.1	6.7
Chloride	5.5	5.5	8.0

Tar River at Grimesland (cont'd.)

Date	3-19-46	9-14-49	Oct. 1955 to Sept. 1956 Average
Fluoride		0.2	
Nitrate	0.3	0.8	2.3
Dissolved solids	53	60	67
Hardness	20	17	23
Specific conductance		64.1	87.6

Tar River at Louisburg, Franklin County

Date	1-6-47	2-17-54
Color	20	12
pH	6.8	7.1
Silica	15	17
Iron	0.07	0.02
Calcium	4.8	4.3
Magnesium	2.1	1.9
Na + K	7.0	6.0
Bicarbonate	24	25
Sulfate	6.7	4.1
Chloride	6.0	4.5
Fluoride	0.2	0.1
Nitrate	0.4	0.2
Dissolved solids	62	56
Hardness	22	19
Specific conductance		68.6

Tar River near Nashville, Nash County

Date	6-7-49	2-15-55	8-31-55	2-1-56	7-31-56
Discharge, c.f.s.	246	2,830	254	256	860
Color	5		40	28	7
pH	7.0	6.2	7.3	7.0	6.6
Specific conductance	65.4	46.8	68.9	71.4	58.6
Silica	17		19	17	17
Iron	0.01		0.05	0.44	0.01
Calcium	4.4	2.4	4.4	5.0	4.6
Magnesium	1.9	1.0	1.3	1.7	1.1
Na + K	6.5		7.5	7.1	6.5
Bicarbonate	30	10	27	30	25
Sulfate	2.3	3	3.1	2.6	2.9
Fluoride	0.1				0.2
Chloride	3.8	3.8	4.8	4.8	3.2
Nitrate	0.4	0.7	1.2	0.2	1.2
Dissolved solids	58	51	54	54	49
Hardness	19	10	16	19	16

Tar River at Oxford, Granville County

Date	1-21-54	Chloride	3.2
Silica	6.7	Fluoride	0.1
Iron	0.10	Nitrate	0.6
Calcium	3.2	Dissolved solids	48
Magnesium	0.7	Hardness	11
Na + K	4.7	Specific conductance	57.3
Bicarbonate	9	pH	6.2
Sulfate	8.2	Color	40

Tar River at Rocky Mount, Nash-Edgecombe Counties

Date	1-7-47	Bicarbonate	27
Color	25	Sulfate	4.8
pH	6.7	Chloride	5.9
Silica	16	Fluoride	0.5
Iron	0.06	Nitrate	0.4
Calcium	4.8	Dissolved solids	61
Magnesium	2.2	Total hardness	21
Na + K	7.5		

Tar River at Spring Hope, Nash County

Date	1-6-47	Bicarbonate	23
Color	20	Sulfate	6.0
pH	6.6	Chloride	5.4
Silica	10	Fluoride	0.5
Iron	0.05	Nitrate	0.4
Calcium	4.6	Dissolved solids	60
Magnesium	1.9	Total hardness	19
Na + K	6.9		

Tar River at Tarboro, Edgecombe County

Date	1944-45	1-6-47	2-16-55	8-31-55	2-1-56	7-31-56
Discharge, c.f.s.	3,403	2,350	3,360	1,560	1,160	1,300
Suspended matter	31					
Color	39	27		45	8	20
Silica	13	16		14	12	13
Iron	0.13	0.03		0.30	0.48	0.02
Calcium	4.2	4.6	4.1	6.0	4.8	5.1
Magnesium	1.6	2.5	0.9	1.2	1.2	1.1
Na + K	5.6	6.1		7.0	7.9	6.5
Bicarbonate	22	26	10	21	25	19
Sulfate	4.1	4.3	4	5.4	5.3	4.9
Chloride	4.0	5.6	4	5.8	5.8	3.8
Fluoride		0.4				
Nitrate	0.6	0.4	0.3	0.9	0.7	2.3
Dissolved solids	54	58	54	51	50	46
Total hardness	17	22	14	20	17	17
pH		6.7	6.2	5.6	7.0	6.6
Specific conductance			56.7	73.6	74.4	61.5

Tar River near Tarboro, Edgecombe County

Date	3-28-51	Na + K	6.5
Color	27	Bicarbonate	21
pH	6.9	Sulfate	5.7
Specific conductance	68.5	Chloride	5.8
Silica	7.9	Nitrate	0.2
Iron	0.05	Dissolved solids	54
Calcium	4.5	Total hardness	17
Magnesium	1.5		

Tar River near Tar River, Granville County

Date	1-6-47	12-12-48	6-7-49	5-3-55	8-29-55	1-31-56
Discharge, c.f.s.	95	122	30	50.1	29	33
Color	35	7	3		31	7
pH	6.7	6.9	6.6	6.8	7.5	7.1
Silica	9.6	14	14		15	14
Iron	0.04	0.01	0.02		0.14	0.57
Calcium	5.0	4.9	5.3	5.2	10	6.4
Magnesium	2.4	2.1	2.5	1.9	2.1	2.6
Na + K	5.9	4.4	6.0		6.0	7.4
Bicarbonate	24	22	34	29	44	38
Sulfate	4.7	5.0	2.6	4.7	2.9	5.2
Chloride	6.8	4.8	3.9	3.8	4.0	6.5
Fluoride	0.3	0.1	1.1		0.1	0.1
Nitrate	0.2	0.4	0.4	0.9	0.4	0.3
Dissolved solids	68	52	55	70	63	62
Total hardness	22	21	24	21	34	27
Specific conductance		69.4	74.0	68.0	90.3	93.1

Tar River at Washington, Beaufort County

Date	1-6-47	Bicarbonate	25
Color	32	Sulfate	7.8
pH	6.4	Chloride	23
Silica	14	Fluoride	0.4
Iron	0.06	Nitrate	0.5
Calcium	5.7	Dissolved solids	92
Magnesium	2.6	Total hardness	25
Na + K	17		

Town Creek near Pinetops, Edgecombe County

Date	8-14-49	4-19-50	9-4-50	10-3-50	11-29-50	6-5-51	7-14-51
Disch. c.f.s.	6.08	29.0	2.84	6.51	25.0	1.22	2.28
Color	26						
pH	6.0	6.5	6.6	6.7	6.2	6.5	6.3
Specific conductance	88.5	74.7	83.7	99.2	105	88.5	94.2
Silica	12						
Iron	0.11						
Calcium	6.2						
Magnesium	1.3						
Na + K	8.9						
Bicarbonate	16	24	20	22	19	55	27
Sulfate	12	3	4	17	8	8	12
Chloride	9.2	8.0	7.2	9.8	12	7.5	8.0
Fluoride	0.4						
Nitrate	0.6						
Dissolved solids	69						
Total hardness	21	18	20	21	17	44	24

Town Creek near Pinetops (cont'd)

Date	9-12-52	10-30-52	4-27-53	6-4-53	8-31-53	4-7-54	9-17-54
Discharge, c.f.s.	26.8	5.11	34.2	3.55	2.73	240	0.26
Calcium							4.4
Magnesium							1.7
Bicarbonate	12	22	21	20	18	9	19

Town Creek near Pinetops (cont'd)

Date	9-12-52	10-30-52	4-27-53	6-4-53	8-31-53	4-7-54	9-17-54
Sulfate	7	7	3	4	8	6	3
Chloride	7.5	9.2	8.0	7.8	9.8	7.8	5.8
Nitrate							2.3
Total hardness	16	20	14	18	19	13	18
Specific conductance	67.6	84.4	77.2	80.9	96.1	63.5	74.9
pH	6.4	7.4	6.4	6.5	6.4	6.3	6.6

Tranters Creek at Latham, Beaufort County

Date	4-21-49	9-14-54	9-30-54	11-4-54	11-30-54	2-17-55	6-1-55
Color	100						
pH	6.0	5.8	6.0	5.6	6.9	5.6	5.8
Specific conductance	54.5	127	105	648	810	205	105
Silica	3.4						
Iron	0.27						
Calcium	3.6			16	17	13	5.3
Magnesium	4.4			8.0	12	3.9	1.4
Na + K	1.9						
Bicarbonate	10	9	12	6	9	5	12
Sulfate	8.6	16	12	29	20	29	11
Chloride	9.8	12	13	155	210	15	14
Fluoride	0.1						
Nitrate	0.1						
Dissolved solids	71						
Total hardness	27	32	19	73	92	48	19

Tranters Creek near Washington, Beaufort County

Date	2-8-46	4-7-47	10-7-48	9-14-54	9-30-54	11-30-54	2-17-55	6-1-55
Color	60	110	45					
pH	6.0	6.0	6.4	6.4	6.7	6.7	6.4	6.6
Silica	5.6	4.0	7.8					
Iron	0.05	0.45	0.17					
Calcium	3.8	3.2	21			60	24	11
Magnesium	1.2	1.0	41			180	46	14
Na + K	6.3	5.9	321					
Bicarbonate	8.0	10	23	41	39	47	19	26
Sulfate	9.7	6.4	86	279	231	370	108	35
Chloride	8.0	6.9	575	1,870	1,580	2,600	655	212
Fluoride		0.1	0.1	648	530			
Nitrate	0.2		0.3					
Dissolved solids	58	56	1,160					
Hardness	14	12	221			890	25	83
Specific conductance				6,040	5,100	8,000	2,270	824

Tranters Creek near Wharton, Beaufort County

Date	4-7-47	Bicarbonate	13
Color	110	Sulfate	5.9
pH	5.95	Chloride	6.5
Silica	2.5	Fluoride	0.1
Iron	0.31	Dissolved solids	54
Calcium	3.0	Total hardness	13
Magnesium	1.3	Na + K	6.1

CHAPTER IX - ABATEMENT OF STREAM POLLUTION

Pollution Abatement Legislation - The General Assembly of North Carolina, on April 6, 1951, rativied an act to rewrite Article 21 of Chapter 143 of the General Statutes relating to stream sanitation. This act contains a declaration of policy as follows. It is hereby declared to be the policy of the State that the water resources of the State shall be prudently utilized in the best interest of the people. To achieve this purpose, the government of the State shall assume responsibility for the quality of said resources. The maintenance of the quality of the water resources requires the creation of an agency, charged with this duty and authorized to protect the water requirements for health, recreation, fishing, agriculture, industry, and animal life. This agency shall establish and maintain a program, adequate for present needs and designed to care for the future needs of the State.

The State Stream Sanitation Committee - The act created within the State Board of Health a permanent committee, to be known as the "State Stream Sanitation Committee". The duties of the Committee are (1) to develop and adopt classifications of State waters, (2) to survey all waters and identify those which ought to be classified, (3) to assign a classification to each identified water, and (4) to hold public hearings regarding assigned classifications.

Control of New Sources of Pollution - After the effective date of the assignment of classifications pertaining to the identified waters of any watershed within the State, no person shall, to an extent which would adversely affect the condition of the receiving water within such watershed in relation to any of the standards applicable to such water, (1) make any new outlet into the waters of such watershed, (2) construct or operate any new disposal system within such watershed, (3) alter or change the construction or the method of operation of any existing disposal-system within such watershed, (4) increase the quantity of sewage, industrial waste, or other waste discharged through any existing outlet or processed in any existing disposal system, or (5) change the nature of the sewage, industrial waste, or other waste discharged through any existing outlet or processed in any existing disposal system.

Actions by the Committee - The Committee adopted a series of classifications, after holding, in 1953, public hearings at Asheville, Charlotte, Greensboro, Fayetteville, and Washington. It has assigned classifications to the waters of the Yadkin-Pee Dee, Whiteoak (including North, Northport, and New), Chowan, Roanoke, and French Broad River Basins. Classifications of the waters of the Cape Fear and Neuse River Basins are expected to be assigned during 1958. Surveys of the waters of the Catawba, Pasquotank, Tar-Pamlico, and Little Tennessee River Basins, upon which assignments of classification to such waters will be based, are in progress.

Tar-Pamlico River Basin - Maps, for use in field surveys of the waters in this basin, were prepared in December 1957. A survey of pollution sources and water uses was initiated on January 9, 1958 and was completed in March 1958. Stations for the stream-sampling program were established in March and April 1958, mobile laboratories were stationed at Rocky Mount and Washington in May, and stream sampling was initiated in June. When the survey has been completed, a pollution-survey report will be prepared. This report will contain proposed classifications of the waters of the basin. After these classifications have been considered at public hearings, classifications will be assigned to the waters, and a comprehensive pollution-abatement plan, for action by municipalities and industries, will be prepared.

General - Information regarding water control; problems of watershed management; the Watershed Protection and Flood Prevention Act (Public Law 566, 83rd Congress, 2nd Session, approved August 4, 1956); the first annual National Watershed Congress (December 6 and 7, 1954); and the North Carolina Soil Conservation Districts Law, enacted by the 1937 Session of the General Assembly, may be found in Chapter XIII of "Water Resources of North Carolina, Department of Conservation and Development, 1955". The quoted publication comprises Volume I of a series of 12 volumes pertaining to the water resources of the State, of which the material herein, regarding the water resources of the Tar-Pamlico River Basin, forms Volume IX.

Soil Conservation Practices Accomplished and Contemplated - The data contained in the following tables of "Soil Conservation Practices Accomplished" and "Soil Conservation Practices Contemplated" were furnished by the State Conservationist, Soil Conservation Service, U. S. Department of Agriculture, Raleigh, North Carolina, for 12 counties, each of which forms substantial parts of the areas of the Tar-Pamlico River Basin.

These 12 counties are included in six Soil Conservation Districts as follows:

Soil Conservation Districts	Counties
Coastal Plain	Edgecombe, Martin and Pitt
Dan River	Person
Fishing Creek	Halifax and Warren
Lower Neuse	Pamlico
Pamlico	Beaufort
Tar River	Franklin, Granville, Nash, and Vance.

All or a part of the following counties lie in the Tar-Pamlico River Basin as indicated:

Beaufort	Central, 9/10
Edgecombe	All
Franklin	Northern, 9/10
Granville	Central, 3/4
Halifax	Southwestern, 3/5
Hyde	Southern, 1/2
Martin	Southwestern, 3/10
Nash	North and Central, 7/10
Pamlico	North and Eastern, 1/10
Person	Eastern Central, 1/10
Pitt	Northern, 3/5
Vance	Southern, 1/2
Warren	Southern, 7/10
Wilson	North Corner, 1/5

The greater part of Hyde County consists of swamps. A considerable portion of the part of Wilson County, which lies in the Tar-Pamlico River Basin, also consists of swamps.

Because of the manner in which soil conservation districts were originally organized, some districts include one county which may lie in one, two, or three river basins, whereas other districts may contain, wholly or partially, as many as five counties. For example, parts of Forsyth County

SOIL CONSERVATION PRACTICES ACCOMPLISHED

ITEM	UNIT	BEAUFORT	EDGE-COMBE	FRANK-LIN	GRAN-VILLE	HALIFAX	MARTIN	NASH	PAMLICO	PERSON	PITT	VANCE	WARREN	TOTAL
Closed Drains	Lin.Ft.	76,656	646,692	212	0	37,396	149,937	141,326	11,541	8	1476,344	0	252	2540,364
Conservation Crop Rotation	Acres	4,115	30,971	51,337	13,629	14,004	3,534	52,041	3,028	1,081	18,447	13,174	11,201	216,562
Contour Farming	Acres	1,500	4,495	27,201	6,875	16,147	191	22,566	2	365	608	18,800	24,660	123,410
Contour Strip Cropping	Acres	0	0	3,898	135	380	0	525	0	79	0	88	16	5,121
Cover Cropping	Acres	7,870	10,027	43,319	8,499	15,038	2,138	21,856	1,357	348	321	18,094	20,224	149,091
Critical Area Planting	Acres	0	149	2,820	0	103	0	138	15	10	72	96	293	3,696
Crop Residue Utilization	Acres	4,070	39,122	25,697	2,063	25,682	5,625	43,368	3,669	218	33,471	15,835	15,043	102,883
Drainage	Acres	86,910	9,368	1	113	2,720	2,178	3,086	3,581	69	26,358	59	651	135,094
Group Enterprise	Miles	280	59	0	0	0	13	0	13	0	223	0	0	588
Group Enterprise	Cu.Yds.	2223,000	737,437	0	0	0	157,581	0	91,438	0	2363,678	0	0	5573,134
Improvement Cutting	Acres	0	2,591	5,011	1,656	9,733	814	21,298	524	5	10,908	3,480	1,367	57,387
Open Drains	Miles	280	87	15	1	57	13	40	120	2	93	0	7	715
Open Drains	Cu.Yds.	2223,000	699,130	75,000	3,040	285,000	62,604	124,201	619,956	10,000	831,529	0	31,500	4964,960
Pasture Planting	Acres	5,637	9,540	6,436	2,105	5,887	560	3,308	127	94	3,964	12,794	3,814	54,266
Pond Construction	No.	28	134	441	180	120	20	337	1	5	200	69	60	1,595
Sprinkler Irrigation Systems	No.	7	13	60	26	5	3	51	1	0	52	0	7	225
Sprinkler Irrigation Systems	Acres	100	213	366	309	101	50	781	24	0	2,465	6	225	4,640
Terracing	Miles	0	1,118	1,492	440	855	11	1,250	0	23	33	512	1,171	6,905
Tree Planting	Acres	7	191	789	196	303	9	251	4	4	42	59	733	2,588
Waterway Development	Acres	0	60	1,301	195	683	1	815	1	39	1	352	943	4,391
Wildlife Area Development	Acres	8	89	0	0	0	5	0	4	10	99	0	0	215
District Cooperators	No.	979	624	1,413	1,320	1,006	897	1,536	502	1,367	1,379	1,196	1,164	13,383

SOIL CONSERVATION PRACTICES CONTEMPLATED

ITEM	UNIT	BEAUFORT	EDGE-COMBE	FRANK-LIN	GRAN-VILLE	HALIFAX	MARTIN	NASH	PAMLICO	PERSON	PITT	VANCE	WARREN	TOTAL
Closed Drains	Lin.Ft.	63,344	5441,804	46,789	7,790	2737,244	486,663	998,974	387,459	4,412	4503,656	47,000	33,012	14,858,147
Conservation Crop Rotation	Acres	9,888	105,379	67,964	22,046	76,033	7,636	46,532	7,434	450	6,910	11,022	49,828	411,122
Contour Farming	Acres	8,500	14,899	30,605	26,462	46,611	1,355	75,108	1,098	535	3,234	12,457	34,069	254,933
Contour Strip Cropping	Acres	0	703	28,244	16,433	17,123	22	34,738	0	1,130	0	8,312	13,706	120,411
Cover Cropping	Acres	8,238	83,922	102,745	24,563	73,137	3,961	104,440	9,105	547	5,999	13,229	13,167	443,053
Critical Area Planting	Acres	0	125	15,980	380	1,034	15	1,584	187	43	254	1,337	4,716	25,655
Crop Residue Utilization	Acres	10,930	95,751	14,785	23,376	67,854	6,375	93,671	1,368	208	47,780	14,100	45,639	421,837
Drainage	Acres	153,090	66,420	5,230	3,134	21,548	1,604	8,828	6,921	269	4503,656	1,006	2,437	4774,143
Group Enterprise	Miles	211	315	0	0	0	9	0	28	0	0	0	0	563
Group Enterprise	Cu.Yds.	1921,000	4093,555	0	0	0	74,701	0	53,357	0	0	0	0	6142,613
Improvement Cutting	Acres	1,000	91,466	4,960	45,524	33,282	241	11,824	28,222	487	65,903	15,571	40,207	338,687
Open Drains	Miles	211	744	127	54	240	9	280	230	2	663	14	145	2,719
Open Drains	Cu.Yds.	1921,000	6130,786	635,000	216,220	1210,402	66,841	1574,817	968,838	3,272	7317,521	47,000	126,000	20,217,697
Pasture Planting	Acres	4,877	18,208	4,374	5,372	8,050	195	10,355	675	158	19,114	3,998	3,863	79,239
Pond Construction	No.	70	424	867	78	328	71	207	1	13	450	99	553	3,161
Sprinkler Irrigation Systems	No.	243	126	395	162	524	25	304	3	0	105	212	282	2,381
Sprinkler Irrigation Systems	Acres	5,000	1,188	5,387	1,857	5,190	782	3,772	28	0	1,467	2,728	8,077	35,476
Terracing	Miles	0	578	9,446	1,503	2,767	80	3,409	42	88	277	2,576	4,651	25,417
Tree Planting	Acres	93	850	964	1,549	806	46	1,151	398	50	98	674	14,490	21,169
Waterway Development	Acres	0	225	157	438	457	20	815	5	49	34	8	624	2,832
Wildlife Area Development	Acres	42	42	0	0	0	25	0	4	27	928	0	0	1,068
District Cooperators	No.	2,345	3,352	2,704	2,015	3,468	1,870	4,319	287	1,478	4,590	1,208	1,998	29,634

lie in the Cape Fear, Roanoke, and Yadkin-Pee Dee River Basins. Six of the sixteen districts, including one county, lie in two river basins; and eight and seven of the 37 districts, comprising the State as a whole, contain, wholly or partially, four and five counties, respectively. The records of the State Conservationist are maintained on a district, and on a county, basis. Consequently, when a county lies in two or more basins, it was necessary for the State Conservationist to use estimates instead of actual accomplishments. He feels sure, however, that the figures of the two tables are accurate enough for all practical purposes.

The large number of district cooperators, shown on the table of "Soil Conservation Practices Contemplated", does not necessarily signify an unwillingness on the part of farmers in those counties to carry out soil conservation plans. On the other hand, it simply means that the small number of Soil Conservation Service technicians available in North Carolina have been unable thus far to work with all of these farmers. The State Conservationist hopes to reach them all as rapidly as possible.

Watershed Protection and Flood Prevention - The State Conservationist, Soil Conservation Service, U. S. Department of Agriculture, Raleigh, North Carolina, advised representatives of certain Federal and State agencies, on January 17, 1957, that the Lowlands Watershed, including approximately 2,589 acres in Pamlico County, has been approved by the Administrator of the Soil Conservation Service for planning assistance in accordance with Public Law 566.

Lowlands Watershed lies in the area between Eastern Creek, Goose Creek, Pamlico River, Oyster Creek, James Creek, and Middle Prong. At the time of preparation of "Water Resources of North Carolina - Tar Pamlico River Basin", development of a work plan for the Lowlands Watershed was in progress.

CHAPTER XI - NAVIGATION AND FLOOD CONTROL

NAVIGATION

Existing Navigation Project - This project was authorized by the River and Harbor Acts of August 14, 1876, March 3, 1879, August 11, 1888, March 2, 1907, July 25, 1912, July 3, 1930, and August 26, 1937, and provides for a channel, 12 feet deep at mean low water and 200 feet wide, from the 12-foot contour in the Pamlico River below Washington to the Atlantic Coast Line Railroad bridge at Washington; 12 feet deep and 100 feet wide from Washington to a turning basin of the same depth, 200 feet wide and 300 feet long, in Hardee Creek, five miles below Greenville; 6 feet deep and 75 feet wide from Hardee Creek to Greenville; 20 inches deep and 60 feet wide from Greenville to Tarboro; and thence to clear the natural channel above Tarboro to Little Falls about one mile below Rocky Mount. The total length of the project between Pamlico Sound and Little Falls is 121 miles, and the length of section under improvement is 97 miles, extending from a point in the Pamlico River 14 miles below Washington to Little Falls. The project was completed in 1939 at a cost of about $674,700.

The stream is nontidal. Variations in the water surface at Washington, dut to prevailing winds, seldom exceed two feet. The extreme range of the flood or freshet stage for the upper section is 34 feet at Tarboro. For the lower section, the extreme range due to winds is 8.3 feet.

Controlling depths are as follows: 11.3 feet to the Norfolk Southern Railway Bridge at Washington, 4.5 feet to Hardee Creek, 2.5 feet at mouth of Hardee Creek, 12 feet in basin in Hardee Creek, 2.6 feet to Greenville, and one foot to the mouth of Fishing Creek about eight miles above Tarboro.

Average annual water-borne commerce for the period 1951-1955 was about 49,000 tons, principally logs and petroleum products. Commerce in 1955 totaled about 64,000 tons.

House Document No. 187, 72nd Congress, 1st Session - This document, published in December 1931, contains the reports of the Chief of Engineers, the Board of Engineers for Rivers and Harbors, and the District Engineer, Wilmington District, on Tar River covering navigation, flood control, power development, and irrigation. The report of the Chief of Engineers was made under the provisions of House Document No. 308, 69th Congress, 1st Session, which was enacted into law, with modifications, in Section I of the River and Harbor Act of January 21, 1927. Extracts from the reports, indicated above, follow.

Improvement considered - Dredging alone is not feasible, and canalization is deemed the best method of improvement. The channel considered is one which could readily become a branch to the Intracoastal Waterway; that is, 10 feet deep and 80 feet wide, or 12 feet deep and 90 feet wide, to Tarboro. Such depths to Greenville could be obtained by a lock and dam at Yankee Hall Landing (about 11.5 miles above Washington) and to Tarboro by one additional lock and dam at Pillsboro Landing (about 10 miles above Greenville), but preferably by two additional locks and dams, one at Browns Old Ferry (four miles above Greenville) and one at Old Sparta (about 7.5 miles below Tarboro)....

Benefits - The principal benefits which would result from the further improvement of the Tar River are found in lower transportation costs. Tarboro and Greenville would become distributing centers and, possibly the further improvement of the river would lead to the establishment of additional

industries at those places. The local benefits would be large as compared with general benefits and, consequently, should the stream be further improved for navigation purposes, local interests should be required to cooperate by furnishing, free of costs to the United States, disposal areas for dredged material; land required for the construction, maintenance, and operation of the locks and dams; and the land which would be overflowed through the construction of dams. In addition, local interests should give assurances, satisfactory to the Chief of Engineer and the Secretary of War, that adequate terminals would be constructed and any necessary alterations to bridges made without expense to the United States.

Estimates - The estimated cost of providing a channel, 10 feet deep and 80 feet wide, from Washington to Tarboro by means of three locks and dams is $2,074,440, with annual costs of $30,500 for maintenance, operation, and care. If, to the latter figure, there should be added interest and amortization charges, the total annual cost of improvement would be $169,860. The estimated annual benefits are approximately $90,950. The estimated cost of providing the same channel by means of two locks and dams, supplemented by dredging, is $1,679,160 with an annual cost of $57,000 for maintenance, operation, and care. Adding interest and amortization charges to this latter figure gives a total of $169,806 as the annual cost of the improvement. The annual costs being approximately the same, the former channel-plan is considerable preferable because of the uncertainty and difficulty of securing and maintaining that part of the channel in the latter plan which would require dredging. In neither case do the benefits warrant the adoption of the project.

FLOODS AND FLOOD DAMAGES

Causes of floods on the Tar River - The floods on the Tar River are, in general, caused by an excessive rate of precipitation following a period of prolonged rainfall. Because of the shape of the basin and the valley storage which is obtained below the Fall Line, the intensity is not so great as might be expected from the rate of precipitation which occurs. A complete discussion of the effect on floods caused by the shape of the basin and by this valley storage is contained in Appendix C (House Document No. 187, 72nd Congress, 1st Session).

Great floods - Large floods occurred on this stream in 1877, 1919, 1924, and 1928. The flood of July 1919 was considerably larger than any other flood on record in this basin. This flood reached a stage of 33.2 feet at Tarboro and, due to the season of the year in which it occurred, caused great damage. The flood of October 1924 was the next largest on record and reached a stage of 31.8 feet at Tarboro. Based on figures compiled by the Weather Bureau, the damages occasioned by these floods are estimated as $1,270,000 for the former, of which $1,000,000 was caused by damages to crops; and as $130,500 for the latter, of which $70,000 was caused by damage to crops. Had the 1924 flood occurred a month earlier, it would have caused damage to the extent of about $800,000. The damage caused by the flood of 1928 was estimated by this office (Wilmington District, Corps of Engineers) at $230,000.

Nature of flood damages - The losses due to floods, on the Tar River and its tributaries above the Fall Line, are comparatively small, due to the character of the streams which have narrow valleys and steep gradients. When the Fall Line is reached, the slopes of the streams become flat and their flood plains are wide. Consequently, they inundate large areas during floods. A large portion of the area thus overflowed is under cultivation, and much damage is done if the floods occur during the growing season. Highways are

also damaged, and indirect damages are sustained by the merchants of the towns affected, due to the interruption to transportation. The flood losses are heaviest between the towns of Rocky Mount and Greenville.

Frequency of damaging floods - Damage due to overflow begins to occur along the Tar River and its tributaries when the United States Weather Bureau gage at Tarboro reaches a stage of 22 feet. From the study of flood frequency on this stream (see Appendix C), that stage may be reached or exceeded at Tarboro once in each two-year period. Based on the past performance of the stream, floods causing a loss of $100,000 or more may be expected once in each five-year period and those, causing damages of $1,000,000 or more, about once in every 35-year period. The average annual damage, due to overflows on the Tar River and its tributaries, is estimated as $118,000. A discussion of the methods, employed in determining these figures, is contained in Appendix C.

Flood against which protection should be provided - There is no record of any loss of life due to floods on the Tar River and, consequently, the question of determining the extent, to which flood control would be warwanted, is purely an economic one. After a consideration of the nature and extent of flood damages in this area, the conclusion has been reached that the complete control of floods larger than the 10-year flood would not be warranted. Works, which would provide absolute protection against 10-year floods, would lessen the effect of greater floods, and the interest on the sum necessary to provide greater protection would more than pay for the damages which would be caused by these larger and less frequent floods. The 10-year flood would reach a stage of approximately 30 feet at Tarboro.

PROPOSED PLAN FOR FLOOD CONTROL

Method of flood prevention proposed - In general, flood control may be accomplished by any one, or the combination of two or more, of the following methods: By levees or dikes, by channel improvements, by diversions or by-passes, and by retention or retarding reservoirs. After giving due consideration to all of the above methods (see Appendix C, House Document No. 187, 72nd Congress, 1st Session), it is concluded that the most feasible method for the Tar River would be its control by means of retarding reservoirs, and that method was selected for study.

Selection of reservoir sites - A complete reconnaissance and study of the Tar River and its tributaries disclosed that the same reservoirs, which were selected for power studies (see "Sites selected" in Chapter V of this publication), were also the best sites available for flood-control reservoirs. After due consideration, it was decided that the sites previously selected for power dams (on Fishing Creek near Meltons Bridge, on Tar River immediately below Webbs Bridge, on Tar River near the mouth of Sapony Creek, and on Tar River at Tarboro) were also the best sites for flood-control reservoirs. If additional control were desired, a dam on Swift Creek, at the crossing of North Carolina State Highway No. 43 in Nash County, and one, at the proposed site on Tar River immediately below the mouth of Sapony Creek, would provide it. It is believed that the reservoirs at Meltons Bridge and Webbs Bridge will give approximately the desired control, and, therefore, these two projects were selected for study.

Drainage area controlled by the proposed plan - The total drainage area, which would be controlled by these two reservoirs, is 1,105 square miles or 53 percent of the entire 2,100 square miles of drainage area of the Tar River at Tarboro.

Storage capacity available in proposed plan - Based on allowances made for silting of flood-control reservoirs, the storage-capacity, available for storing flood waters at the Meltons Bridge project, would be 139,000 acre-feet which is equivalent to a depth of 437 square miles above this site. The storage capacity, available at the Webbs Bridge project, would be 190,000 acre-feet which is equivalent to a depth of 5.3 inches on the drainage area of 668 square miles above this site. The runoff, from the maximum storm of record on the Tar River Basin at Tarboro, was 5.8 inches on the drainage area above that point.

Effect of proposed reservoir plan on floods - The proposed retarding reservoirs would reduce the stage, of a flood similar to that of July 1919, from 33.2 to 26.6 feet at Tarboro. The 100-year flood would be reduced, at this same point, from 34.8 feet to 28.4 feet, and the annual losses would be reduced by $1,570,000. The 50-year flood would be reduced from a stage of 33.5 to 27.2 feet, and the annual losses would be reduced from $400,000 to $32,000. It is, therefore, believed that the proposed plan would give approximately the protection which is warranted by the type of damages. It is estimated that the average annual loss, which would be prevented by the improvement, would amount to approximately $109,000. Furthermore, it is estimated that the intangible benefits, such as those derived from the increased stream-flow during dry periods and the general improvement of the lands subject to overflow, will make the total benefits about double the amount estimated for direct loss, or $218,000. By capitalizing this benefit, it is found that the justifiable sum, which might be spent on the proposed plan, is $3,633,300. The cost of constructing the dams and reservoirs is estimated as $4,402,530.

Conclusions - The proposed plan for flood-control reservoirs at Meltons Bridge and Webbs Bridge is not economically feasible. No combination of flood-control reservoirs, either independently or in combination with power development, could be found that was economically sound. Additional water-power development is not economically feasible, and further improvement for navigation is not justified. The further improvement of Tar River for navigation, in connection with power development, the control of floods, or the needs of irrigation, or any combination thereof, is not deemed advisable at the present time.

Flood-control Project Completed - The project provides for clearing and snagging the natural channel between Tarboro and Rocky Mount, a distance of about 40 miles. The work was completed in July 1938 at a Federal cost of about $81,300.

It is estimated that the project has provided flood-control benefits totaling about $210,000 to September 30, 1955. Average annual benefits are estimated at $12,000.

Emergency Flood-Control Work - Snagging operations for flood control on Tar River began in Fiscal Year 1939 on the section between Tarboro and Dupree Landing. An allotment of $13,000 was received and expended during the year.

An allotment of $6,800 was received during Fiscal Year 1941 for sponsoring a Works Progress Administration project for snagging on several Tar River tributaries. Field operations began in November 1941 on these tributaries. A supplemental allotment of $8,100 was received to continue operations during Fiscal Year 1942.

An allotment of $25,000 was received in Fiscal Year 1946 for snagging on Tar River between Hardee Creek (near Greenville) and Rocky Mount. This work was accomplished during Fiscal Year 1947 at a cost of about $18,600.

Total costs of work on Tar River and tributaries under emergency flood-control operations have been about $41,300 of regular funds and about $6,600 of WPA funds. Much of this work has already demonstrated its effect upon the reduction of flood stages along improved reaches of the streams.